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ABSTRACT

Designed for use with individualized instructional units (CE 026 345-347, CE 026 349-351) in the electromechanical cluster, this third volume of the postsecondary teacher's guide presents the task analysis which was used in the development of the REACH (Refrigeration, Electro-Mechanical, Air Conditioning, Heating) curriculum. The major blocks of both the secondary electro-mechanical and postsecondary refrigeration, heating, and air conditioning programs are broken down into major task areas. Each task analysis sheet follows a typical format that provides the following information: major block title, unit number, task, unit title, objectives, detailing and sequencing information, learning type, and type of learning activity. (LRA)

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REACH

TEACHER'S GUIDE

VOLUME III

TASK ANALYSIS

DEVELOPED UNDER CONTRACTUAL AGREEMENT

WITH

DIVISION OF PROGRAM DEVELOPMENT
OFFICE OF VOCATIONAL EDUCATION
GEORGIA DEPARTMENT OF EDUCATION
ATLANTA, GEORGIA 30334
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BY

VOCATIONAL EDUCATION TEACHERS
AND
THE UNIVERSITY OF GEORGIA STAFF
UNDER THE DIRECTION
OF
DR. PAUL SCOTT
VOCATIONAL EDUCATION MATERIALS CENTER
DIVISION OF VOCATIONAL EDUCATION
COLLEGE OF EDUCATION
UNIVERSITY OF GEORGIA
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U.S. DEPARTMENT OF HEALTH,
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TEACHER'S GUIDE VOLUME III
TASK ANALYSIS

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INTRODUCTION

This volume of the Teacher's Guide presents the detailed task analysis which was used in the development of instructional units in the REACH curriculum.

The major blocks of both the secondary Electro-mechanical and post secondary Refrigeration, Heating, and Air conditioning Programs are broken down into major task areas (this task area should not be confused with a task statement). The task area is further divided into units of instruction (which coincide with what most vocational educators would refer to as a task-level unit of instruction). As an example of this layout scheme refer to the following diagram:

Program: Refrigeration, Heating and Air Conditioning
  Major Block: Electricity
    Task Area: Controls and Installation
      Unit: Servicing Solid State Control Circuits

The University of Georgia Vocational Education Materials Center's staff hosted meetings in Athens to determine the content of both the Electro-mechanical curriculum and the Refrigeration, Heating, and Air Conditioning curriculum. Out of these meetings came the basic task list and the list of textbooks which would be used in the project.

In addition to these meetings, the university brought in content experts to further refine the task statements. The next step in developing the task analysis found in this book was to travel to the teachers in the State and find out exactly what should be taught within a task unit and what activities could best be used in the process.

Reflected in this volume of the Teacher's Guide is the result of the initial phase of preparing for curriculum development in the REACH project. A complete task list is presented for both the secondary Electro-mechanical and the post-secondary Refrigeration, Heating, and Air Conditioning Programs. In addition, objectives for each unit are presented along with complete learning details for each unit sequenced into the most advantageous order. Learning types (a combination of Bloom's, and Gange' and Briggs') were used to assign the learning activities for each detail.

This has been a very brief explanation of how this volume was developed rather than an explanation of how it should be used. (Curriculum developers at the VEMC and the project's teacher/writers know the value of a "detail sheet"). However, other Georgia teachers and users of these curriculum materials will also find value in the "detail sheets" when they expand or modify a learning unit to better meet local needs.

The Authors

ELECTRICITY

1. Fundamentals

EL-01. Understanding basic electrical theory

EL-02. Computing Ohm's law and power formulas

EL-03. Using electric meters

EL-04. Identifying series and parallel circuits

EL-05. Identifying electrical symbols

EL-06. Reading a basic schematic diagram

EL-07. Reading an advanced schematic diagram

EL-08. Understanding alternating current principles

EL-09. Determining, selecting wire size and making connections

EL-10. Making main panel connections - air conditioners

II. Electric Motors

EL-11. Servicing shaded pole motors

EL-12. Wiring split phase motors

EL-13. Checking capacitors

EL-14. Hooking up and troubleshooting a PSC (capacitor run) motor

EL-15. Hooking up and troubleshooting a CS motor

EL-16. Hooking up and troubleshooting a CSR motor

EL-17. Hooking up a three phase motor

EL-18. Testing motors

EL-19. Maintenance of electric motors

ELECTRICITY (continued)

III. Electrical Components

- EL-20. Installing and testing a transformer
- EL-21. Installing and testing contacts and relays
- EL-22. Installing and checking thermostats
- EL-23. Installing and checking pressure switches
- EL-24. Troubleshooting an overload
- EL-25. Installing and checking miscellaneous controls
- EL-26. Troubleshooting magnetic starters

IV. Controls and Installation

- EL-27. Wiring packaged air conditioners
- EL-28. Wiring split system air conditioner
- EL-29. Designing control panel
- EL-30. Designing advanced control panel
- EL-31. Troubleshooting electrical control system (basic)
- EL-32. Troubleshooting electrical control system (advanced)
- EL-33. Servicing solid-state control circuits

REFRIGERATION

1. Refrigeration Fundamentals

   REF-01 Identifying career opportunities in Refrigeration, Heating and Air Conditioning

   REF-02 Identifying safe working conditions

   REF-03 Understanding basic refrigeration concepts

   REF-04 Understanding the basic refrigeration cycle

   REF-05 Identifying tools

   REF-06 Tapping, threading, and replacing threads

   REF-07 Fitting nonenclosure and pipe materials

II. Tubing and Pipe

   REF-08 Basic copper tubing operations

   REF-09 Soft soldering copper tubing

   REF-10 Silver brazing

III. Refrigerants

   REF-11 Handling refrigerants

   REF-12 Using access valves

   REF-13 Maintaining refrigeration manifold gauges

   REF-14 Installing and using refrigeration manifold gauges

   REF-15 Using a vacuum pump

   REF-16 Installing refrigeration accessories

   REF-17 Testing for leaks

   REF-18 Charging the system

REFRIGERATION (continued)

IV. Troubleshooting

REF-19 Testing the compressor
REF-20 Applying principles of condenser
REF-21 Applying principles and uses of the evaporator
REF-22 Troubleshooting an automatic expansion valve
REF-23 Applying principles of troubleshooting capillary tubes
REF-24 Troubleshooting thermostatic expansion valve
REF-25 Troubleshooting the refrigeration system

V. Window Air Conditioning

REF-26 Installation of a window unit
REF-27 Performing pre-season start up or window A/C
REF-28 Troubleshooting compressor burnout in a window A/C
REF-29 Evacuating and charging a window A/C unit
REF-30 Troubleshooting fans and fan motors
REF-31 Troubleshooting window air conditioner's (refrigeration cycle)
REF-32 Troubleshooting window air conditioner electric system

VI. Refrigerators and Freezers

REF-33 Understanding basic operations of a refrigerator or freezer
REF-34 Evacuating and charging refrigerators and freezers
REF-35 Troubleshooting refrigerators and freezers (refrigeration cycle)
REF-36 Troubleshooting fans and fan motors
REF-37 Troubleshooting compressor burnout on refrigerators and freezers
REF-38 Troubleshooting refrigerators and freezers (electrical cycle)

RESIDENTIAL WIRING

1. Grounded Outlets

REW-01	Installing 115v appliances outlets
REW-02	Installing convenience outlets
REW-03	Installing lighting outlet
REW-04	Installing split and switched receptacles
REW-05	Installing a doorbell circuit
REW-06	Installing a three-way switch
REW-07	Installing a 230v circuits and outlets

II. Service Entrance

REW-08	Installing service entrance
REW-09	Install main panel
REW-10	Installing temporary service

III. Blueprint Reading

REW-11	Using standard measurement
REW-12	Identifying residential wiring symbols and designing circuits
REW-13	Estimating materials

MAJOR APPLIANCE

1. Installation of Appliances

MA-01	Installing electric ranges
MA-02	Installing electric oven
MA-03	Installing surface unit and hood
MA-04	Installing automatic electric dryers
MA-05	Installing washing machine
MA-06	Installing dishwasher
MA-07	Installing garbage disposals
MA-08	Installing refrigerator and freezer
MA-09	Transporting major appliances

II. Troubleshooting Washing Machine

MA-10	Total washing machine operation
MA-11	Electrical systems operation and troubleshooting
MA-12	Testing and installing capacitors
MA-13	Mechanical systems operation and troubleshooting
MA-14	Checking and replacing belts
MA-15	Water systems operation and troubleshooting
MA-16	Servicing dryer mechanical and air systems
MA-17	Servicing dryer electrical systems

MAJOR APPLIANCE (continued)

III. Troubleshooting automatic dishwasher

MA-18	Testing and replacing solenoid
MA-19	Checking water level control and testing and replacing safety door switch
MA-20	Checking and replacing heating element on dishwasher
MA-21	Testing and replacing motor relay
MA-22	Replacing automatic dispenser
MA-23	Testing and replacing drain pump
MA-24	Testing and installing timer
MA-25	Diagnosing and repairing automatic dishwasher

IV. Troubleshooting electric range

MA-26	Testing and replacing surface unit elements
MA-27	Testing and replacing surface unit switches
MA-28	Testing and replacing oven elements
MA-29	Testing and replacing oven temperature controls
MA-30	Replacing automatic timers
MA-31	Service continuous cleaning and self-cleaning ovens

AIR CONDITIONING

1. Air conditioning Fundamentals

AC-01 Demonstrate a knowledge of air conditioning systems

AC-02 Applying basic air principles

AC-03 Calculating heat loads

AC-04 Applying principles of air movement

AC-05 Identifying air filtering systems

II. Window Air Conditioning

AC-06 Installation of a window unit

AC-07 Performing pre-season start up for window A/C

AC-08 Troubleshooting compressor burnout in a window A/C

AC-09 Evacuating and charging a window A/C unit

AC-10 Troubleshooting fans and fan motors

AC-11 Troubleshooting window air conditioner's (refrigeration cycle)

AC-12 Troubleshooting window air conditioner electric system

III. System and Installation

AC-13 Install condensate drain

AC-14 Installing package unit (residential and mobile home)

AC-15 Installing split system

AC-16 Installing add-on split system

AIR CONDITIONING (continued)

IV. Troubleshooting and servicing

AC-17 Troubleshooting compressor burnout
AC-18 Troubleshooting fans and fan motors
AC-19 Performing pre-season start up
AC-20 Troubleshooting air conditioner's (refrigeration cycle)
AC-21 Troubleshooting air conditioner's (electrical cycle)
AC-22 Troubleshooting air conditioner's (air movement)

V. Heat Pump

AC-23 Understanding principles of the heat pump
AC-24 Evacuating and charging the heat pump
AC-25 Installing reversing valve (refrigeration cycle)
AC-26 Refrigeration cycle and components
AC-27 Installing electrical circuits
AC-28 Adjusting and repairing defrost controls
AC-29 Designing supplementary heat systems
AC-30 Installing package heat pump
AC-31 Installing split system
AC-32 Troubleshooting heat pump

HEATING

I. Electric Heating Systems

HE-01 Demonstrate a knowledge of the principles of electric furnaces and controls

HE-02 Installing electric furnaces

HE-03 Troubleshooting electric furnaces

II. Gas Heating Systems

HE-04 Applying gas fuel combustion and safety principles

HE-05 Understanding basic systems (types of furnaces)

HE-06 Checking gas sources

HE-07 Gas piping principles

HE-08 Adjusting regulators

HE-09 Installing and servicing gas valves

HE-10 Installing and servicing pilot ignition devices

HE-11 Installing and servicing combination gas valves

HE-12 Servicing burners

HE-13 Inspecting and determining temperature rise of heat exchangers

HE-14 Venting heat system

HE-15 Servicing electrical controls

HE-16 Determining combustion efficiency

HE-17 Performing pre-season checkup and start up

HE-18 Troubleshooting the heating system

HEATING (continued)

III. Oil Burning Systems

HE-19	Identifying types of fuel oil and principles of combustion
HE-20	Designing and installing oil piping
HE-21	Installing oil burners
HE-22	Installing and servicing transformers and electrodes
HE-23	Installing oil pumps
HE-24	Servicing blower, nozzle, motor and coupling
HE-25	Recognizing types of heat exchangers and performing the combustion test
HE-26	Installing controls
HE-27	Performing pre-season start up and checkup
HE-28	Troubleshooting the oil burning heating system
HE-29	Installing and servicing humidifiers

MAJOR BLOCK

ELECTRICITY

EL 1	--	EL 19	Secondary
EL 1	--	EL 33	Post Secondary

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-01

TASK Fundamentals

UNIT Understanding basic electrical theory

OBJECTIVE(S)

Develop an understanding of basic electrical theories, fundamentals and safety procedures.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Electrical safety	Concept	Information Sheet
Electrical safety	Discriminative	Assignment Sheet
Atomic Theory	Concept	Text Assignment
Positive negative charges	Concept	Text Assignment
Positive negative charges	Discriminative	Assignment Sheet
Flow of electrons	Concept	Text Assignment
Electron flow	Concept	Slide/tape
Conductors and insulators	Concept	Text Assignment
Conductors and insulators	Discriminative	Assignment Sheet
Electrical potential	Concept	Text Assignment
Current flow and resistance	Concept	Text Assignment
	Discriminative	Assignment Sheet

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-02

TASK Fundamentals

UNIT Computing Ohm's Law and power formulas

OBJECTIVE(S)

Utilize power formulas to calculate power needs.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Electrical Fundamentals	Concept	Slide/tape
Ohm's Law	Concept	Text Assignment
Applying Ohm's Law	Rule-learning	Slide/tape
Applying Ohm's Law	Manipulative	Assignment Sheet (Computations)
Electrical Power	Concept	Text
Utility calculations	Concept	Information Sheet
Apply power calculations	Rule-learning	Slide/tape
Apply power calculations	Manipulative	Assignment Sheet(Computations)

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-03

TASK Fundamentals

UNIT Using electric meters

OBJECTIVE(S)

Read volts, ohms, and amps with an electric meter.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Basic electric meter principles	Concept	Text Assignment
Types of electric meters	Concept	Slide/tape
Amp meter	Concept	Text Assignment
Procedure for using amp meter	Rule-learning	Slide/tape (safety)
		Assignment Sheet. Read faces maintenance
Read amp meter	Manipulative	Job Sheet (Instruction manual) (Read Amperage on 10 pieces of equipment. Leave blank in job)
Volt meter	Concept	Text Assignment
Procedure for using VOM	Rule-learning	Slide/tape
Using VOM to read voltage	Discriminative	Assignment Sheet
Using VOM to read voltage	Manipulative	Job Sheet (Read voltage on 15-20 pieces of equipment) (instructions)
VOM (resistance)	Concept	Text Assignment
Procedure (resistance)	Rule-learning	Slide/tape
Using VOM (resistance)	Discriminative	Assignment Sheet
Using VOM (resistance)	Manipulative	Job Sheet (Read voltage on 15-20 pieces of equipment (resistance)(instruction))
Read Electrical Characteristics	Manipulative	Job Sheet (15 or 20 meter readings volts, amps, Ohms)

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-04

TASK Fundamentals

UNIT Identifying series and parallel circuits

OBJECTIVE(S)

Wire series and parallel circuits and determine the electrical characteristics of each.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Circuit Characteristics	Concept	Text Assignment
2. Series Circuits	Concept	Text Assignment
3. Series Circuits	Discriminative	Slide/tape Assignment Sheet
4. Wire Series Circuit	Manipulative	Job Sheet
5. Obtain Voltage Readings on Series Circuit	Manipulative	Job Sheet
6. Calculate Electrical Characteristics from Series Circuit	Manipulative	Job Sheet
7. Parallel Circuit	Concept	Text Assignment Slide/tape
8. Parallel Circuit	Discriminative	Assignment Sheet
9. Wire Parallel Circuit	Manipulative	Job Sheet
10. Obtain Voltage Reading on Parallel Circuit	Manipulative	Job Sheet
11. Calculate Electrical Characteristics from Parallel Circuit	Manipulative	Job Sheet
12. Series Parallel	Concept	Text Assignment
13. Using Series and Parallel Circuits in A/C systems	Concept	Slide/tape

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-04 (cont'd)

TASK Fundamentals

UNIT Identifying series and parallel circuits

OBJECTIVE(S)

Wire series and parallel circuits and determine the electrical characteristics of each.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
14. Using Series and Parallel Circuits in A/C	Discriminative	Assignment Sheet
15. Draw a Basic Circuit of A/C	Manipulative	Job Sheet

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-05

TASK Fundamentals

UNIT Identifying electrical symbols

OBJECTIVE(S)

Identify electrical symbols.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Introduction (Students need to know symbols)	Concept	Text Assignment
2. Symbols for Loads	Concept	Text Assignment Slide/tape
3. Identify Symbols for Loads	Discriminative	Assignment Sheet
4. Symbols for Contactors and Relays	Concept	Text Assignment Slide/tape
5. Identify Symbols for Contactors and Relays	Discriminative	Assignment Sheet
6. Symbols for Switches	Concept	Text Assignment Slide/tape
7. Identify Symbols for Switches	Discriminative	Assignment Sheet
8. Symbols for Safety Devices	Concept	Text Assignment Slide/tape
9. Identify Symbols for Safety Devices	Discriminative	Assignment Sheet
10. Identify Symbols	Discriminative	Assignment Sheet
11. Identify Symbols from Diagrams	Manipulative	Job Sheet

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-06

TASK Fundamentals

UNIT Reading a basic schematic diagram

OBJECTIVE(S)

Read and draw a basic schematic diagram.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Design of Schematic Diagrams	Concept	Text Assignment
2. Circuit Arrangement of Schematic Diagram	Concept	Slide/tape
3. Application of Schematics	Discriminative	Assignment Sheet
4. How to Read Schematic Diagram	Concept	Text Assignment Slide/tape
5. Review	Discriminative	Assignment Sheet
6. Reading Base Diagram	Manipulative	Job Sheet Read 2 schematics
7. Reading Basic Diagram	Manipulative	Job Sheet Read 2 schematics
8. Draw Schematic Diagram	Manipulative	Job Sheet 1. Draw schematic 2. Draw schematic 3. Draw schematic (Given specifications)

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-07

TASK Fundamentals

UNIT Reading an advanced schematic diagram

OBJECTIVE(S)

Read and draw an advanced schematic diagram.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. How to Read Advanced Schematic Diagrams	Concept	Text Assignment Slide/tape
2. Read Schematic Diagram	Discriminative	Assignment Sheet (Use same diagram as presented in slide/tape).
3. Read Advanced Schematic Diagram	Manipulative	Job Sheet 1. Read advanced schematic 2. Read advanced schematic
4. Draw Advanced Schematic	Manipulative	Job Sheet 1. Draw one advanced schematic (Given specifications).

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-08

TASK Fundamentals

UNIT Alternating Current Principles

OBJECTIVE(S)

Identify, draw and check voltage on a power distribution system.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. A/C Fundamentals	Concept	Text Assignment Slide/tape (Include bits of single/3 phase)
2. A/C Fundamentals	Discriminative	Assignment Sheet
3. Power Distribution	Concept	Text Assignment Slide/tape
4. Draw Power Distribution System	Manipulative	Job Sheet
5. 1 phase Voltage System 115-1-60 230-1-60	Concept	Text Assignment
6. Identify Voltage System	Manipulative	Job Sheet. Go out and check voltage
7. 3 phase Voltage System 208-3-60 230-3-60	Concept	Text Assignment
8. Identify Voltage System	Manipulative	Job Sheet (Check voltages on 3 phase Delta and Wye systems)
9. Higher Voltage Systems (460/3 phase/60)	Concept	Text Assignment
10. Check Voltage of 460-3-60 system	Manipulative	Job Sheet (Check voltage on 460-3 phase -60 Cycle System)
Review of Voltage System	Discriminative	Assignment Sheet

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-09

TASK Fundamentals

UNIT Determining and selecting wire size and making connections

OBJECTIVE(S)

Identify, size and install wire (for an A/C unit).

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types and Sizes of Wire	Concept	Text Assignment (Information Sheet)
2. Identify Types and sizes of Wire	Manipulative	Job Sheet (Student will identify 20 different types and sizes of wire)
3. Factors in Sizing Wire, Fuse, and Conduit	Concept	Text Assignment
4. Familiarization with NEC	Rule-learning	Slide/tape (Layout of NEC)
5. Familiarization with NEC	Discriminative	Assignment Sheet
6. Procedure for Sizing Wire	Rule-learning	Information Sheet; Text Assignment
7. Using NEC Charts and Manuals	Discriminative	Assignment Sheet (Given Amp Draw - Determine wire size)
8. Size Wire for A/C System from Installation Instruction (Manufacturer)	Manipulative	Job Sheet (Size wire for 2 A/C units)
9. Size Wire for A/C System from NEC	Manipulative	Job Sheet (Size wiring for 2 A/C units)
10. Procedure for Connecting Power Supply go A/C	Rule-learning	Slide/tape (1 phase, 3 phase)
11. Wire A/C Units	Manipulative	Wire A/C units (1phase, 3 phase)

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-10

TASK Fundamentals

UNIT OBJECTIVE(S) Making necessary connections to main panel (breaker and fused) to supply service to air conditioners.

Make connections to fused and breaker panels.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Type of Main Panels	Concept	Text Assignment
2. Fuses and Sizing	Concept	Information Sheet
3. Disconnect Switches	Concept	Text Assignment
4. Fusible Panels	Concept	Information Sheet (Manufacturer's Catalog)
5. Fusible Panels and Fuse	Discriminative	Assignment Sheet (Include types of disconnections)
6. Procedure to Make Connections in Fused Panel	Rule-learning	Slide/tape
7. Make Connections to Fused Panel	Manipulative	Job Sheet. Make connections in panel and supply connections to equipment. (1-110v, 1-230v)
8. Breakers (Types) (Breaker Panels)	Concept	Text Assignment Information Sheet (Pages from Catalog)
9. Breakers and Breaker Panels	Discriminative	Assignment Sheet
10. Procedure to make connections and Troubleshoot Breakers	Rule-learning	Slide/tape
11. Install Breaker and Make Connections	Manipulative	Job Sheet (Size and Install breakers and make connections to equipment) (1 phase and 3 phase)
12. Troubleshoot Breaker	Manipulative	Job Sheet (Troubleshoot bad breakers)

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-11

TASK Electric Motors

UNIT Servicing shaded-pole motors

OBJECTIVE(S)

Troubleshoot, operate, disassemble, identify parts of and types of A/C electric motors.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Magnetic Principles	Concept	Text Assignment
2. The Basic Electric Motor	Concept	Text Assignment
3. Types of Electric Motors (Torque)	Concept	Information Sheet (Torque)
3A Types of Motors	Discriminative	Assignment Sheet
4. Identify types of A/C Electric Motors	Manipulative	Job Sheet (Student identifies types of electric motors)
5. Parts of Electric Motors	Concept	Information Sheet (Diagram with parts included)
6. Procedure for disassembly	Rule-learning	Slide/tape
7. Shaded Pole Motor Principles and Uses of Shaded Pole Motors	Concept	Text Assignment
7A Identify Parts of Electric Motors (Split phase)	Manipulative	Job Sheet (Disassemble an electric moto and identify major parts)(Split phase motor)
8. Disassemble Shaded Pole Motor	Manipulative	Job Sheet
9. Operate Shaded Pole Motor	Manipulative	Job Sheet (1-110v 2 speed) (1-110v 1 speed) (1-230v 2 speed)

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-11 (cont'd)

TASK Electric Motors

UNIT Servicing shaded-pole motors

OBJECTIVE(S)

Troubleshoot, operate, disassemble, identify parts of and types of A/C electric motors.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
10. Reverse Shaded Pole Motor	Manipulative	Job Sheet (Reverse Shaded Pole Motor)
11. Procedure for Trouble Shooting Shaded Pole Motor	Rule-learning	Information Sheet
12. Trouble Shooting Shaded Pole Motor	Manipulative	Job Sheet (Troubleshoot 3 Shaded Pole Motors)

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-12

TASK Electric Motors

UNIT Wiring split phase motors

OBJECTIVE(S)

Troubleshoot, operate and disassemble split phase motors.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Split Phase Motor Principles and Uses	Concept	Text Assignment
2. Disassemble Split Phase Motor	Manipulative	Job Sheet (Disassemble Split Phase Motor)
3. Winding Layout of Split Phase Motor	Rule-learning	Information Sheet
4. Split Phase Motor Principles	Discriminative	Assignment Sheet
5. Locate and Pair Windings of Split Phase Motor	Manipulative	Job Sheet (Use Ohmeter to locate the sets of windings on 115/230 v split phase motor)
6. Procedure for Wiring Split Phase Motor	Rule-learning	Slide/tape
7. Operate and Reverse Split Phase Motor	Manipulative	Job Sheet. Wire, Operate and Reverse (1-115v; 1-230v; 1-Dual voltage)
8. Troubleshoot Split Phase Motor	Manipulative	Job Sheet. Troubleshoot 3 split phase motors.
9. Split Phase Hermetic Motor and Starter Relays	Concept	Text Assignment
10. Operate Split Phase Hermetic Motor	Manipulative	Job Sheet. Operate 1-w/current relay; 1-w/hot wire relay

MAJOR BLOCK	ELECTRICITY
UNIT NUMBER	EL-13
TASK	Electric Motors
UNIT	Checking capacitors

OBJECTIVE(S)

Identify, check and determine ratings of capacitors.

DETAILING AND SEQUENCING	**LEARNING TYPE**	**TYPE OF ACTIVITY**
1. Purpose and Types of Capacitors	Concept	Text Assignment
2. Identify Capacitors	Manipulative	Job Sheet (Identify 10 capacitors and electrical characteristics)
3. Capacitor Rules	Rule-learning	Information Sheet
4. Using Capacitor Rules	Manipulative	Job Sheet (Use capacitor rules)
5. Procedure for Checking Capacitors	Rule-learning	Slide/rule
6. Check Capacitors	Manipulative	Job Sheet (Check 10 start and 10 run)
7. Determining Rating of Capacitors	Manipulative	Job Sheet (Determine rating of capacito if information is illegible).

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-14

TASK Electric Motors

UNIT Hooking up and trouble shooting a PSC (capacitor run) motor

OBJECTIVE(S)

Disassemble, operate and troubleshoot a PSC motor.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. PSC Motor Principles and Uses	Concept	Text Assignment
2. Design of PSC Motors (Including Hermetic Motors)	Concept	Information Sheet
2A PSC Motor	Discriminative	Assignment Sheet (Ohmeters)
3. Disassembly of PSC Motor	Manipulative	Job Sheet (Diassemble)
4. Operate a PSC Motor	Manipulative	Job Sheet. Operate PSC Motors (110v, 110v 2 Speed, 230v 2 Speed, 230v 4 Speed, 230v Hermetic)
4A Procedure for Troubleshooting PSC Motor	Rule-learning	Information Sheet
5. Troubleshoot PSC Motor	Manipulative	Job Sheet. Troubleshoot 3 PSC Motors
6. Troubleshoot Hermetic PSC Motor	Manipulative	Job Sheet. Troubleshoot 2 PSC Hermetic Motors.

MAJOR BLOCK Electricity **UNIT NUMBER** EL-15

TASK Electric Motors

UNIT Hooking up & troubleshooting a CS motor

OBJECTIVE(S)

Disassemble, operate and troubleshoot a CS motor.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types & Principle of CS motors	Concept	Text assignment
2. Hermetic CS motors & relays	Concept	Information sheet
3. CS motors	Discriminative	Assignment sheet
4. Disassemble open type CS motor	Manipulative	Job sheet Disassemble CS motor
5. Procedures for wiring CS open & Hermeter motor	Rule learning	Slide/tape
6. Wire & operate CS Hermetic & open type motor	Manipulative	Job sheet Operate CS motors 1 - 110V 1 - 110V Hermetic 1 - 230V 1 - dual voltage
7. Procedure for trouble-shooting CS motor	Manipulative	Job sheet Troubleshoot CS motor 2 - Open type 2 - Hermetic

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-16

TASK Electric Motors

UNIT Hooking Up and Troubleshooting a CSR Motor

OBJECTIVE(S)

Wire and operate a CSR motor.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types & principles of CSR motors	Concept	Text assignment
2. Starting relays	Concept	Text assignment (operation) 1. Current type 2. Thermal type 3. Potential type
3. CSR motors & starting relays	Discriminative	Assignment sheet
4. Procedure to wire up CSR motor	Rule learning	Information sheet
5. Operate CSR motor	Manipulative	Job sheet 1. Wire & operate CS motor with current & thermal type relays 2. Wire & operate CS motor with potential relay 3. Add running capacitor to #2 to make CSR 4. Wire & operate CSR motor (2)
6. Procedure for adding hard start kit to compressor	Rule learning	Information sheet
7. Add hard start kit to PSC motor	Manipulative	Job sheet Add hard start kit to PSC motor
8. Trouble shoot thermal, current & potential relays	Concept	Text assignment

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-16 (cont'd)

TASK Electric Motors

UNIT Hooking up and Troubleshooting a CSR Motor

OBJECTIVE(S)

Wire and operate a CSR motor.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
9. Troubleshoot current & thermal relays	Manipulative	Job sheet (Troubleshoot current & thermal relays)
10. Troubleshoot Potential relays	Manipulative	Job sheet (Troubleshoot potential (4) relays
11. Procedure for trouble-shooting CSR motor	Rule learning	Slide/tape
12. Troubleshoot CSR motors	Manipulative	Job sheet Troubleshoot 3 CSR motors

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-17

TASK Electric Motors

UNIT Hooking up a three phase motor

OBJECTIVE(S)

Wire and troubleshoot a three phase motor.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Principles of 3 phase motors	Concept	Text assignment
2. Principles of 3 phase motors	Discriminative	Assignment sheet
3. Wire (operate 3 phase motor	Manipulative	Job sheet Wire, operate & reverse three, 3 phase motors
4. Troubleshoot 3 phase motors	Concept	Text assignment
5. Troubleshoot 3 phase motors	Discriminative	Assignment sheet
6. Troubleshoot 3 phase motor	Manipulative	Troubleshoot three, 3 phase motors

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-18

TASK Electric Motors

UNIT Testing motors

OBJECTIVE(S)

Troubleshoot electric motors.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Troubleshooting electric motors (open type & Hermetic)	Manipulative	Job sheet Troubleshoot 10 electric motors

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-19

TASK Electric Motors

UNIT Maintenance of electric motors

OBJECTIVE(S)

Service electric motors and motor drives.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Motor bearings & lubrication	Concept	Text assignment
2. Motor bearings & lubrication	Discriminative	Assignment sheet
3. Lubricate electric motors	Manipulative	Job sheet Lubricate motors (Ball bearings sleeve bearings)
4. Motor drives	Concept	Text assignment
5. Motor drives	Discriminative	Assignment sheet
6. Inspect different types of motor drives	Manipulative	Job sheet Inspect (a) Belt drive appliance (b) Direct drive appliance 1. Flex coupling 2. Flange coupling 3. Direct connection
7. Change V belts & correctly align	Manipulative	Job sheet 1. Change V belts (2 belt applicater) and correctly align

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-20

TASK Electrical Components

UNIT Installing and testing a transformer

OBJECTIVE(S)

Install, test, and troubleshoot transformers.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Transformers (types & purpose)	Concept	Text assignment
2. Wire & check voltage of 208/230/110v to 24 volt transformer & 230/to 110v	Manipulative	Job sheet Wire & check voltage of 208/240v to 24v 110v to 24v 230 v to 110v Transformer
3. Special purposes of transformers (Buck & Boost)	Concept	Information sheet
4. Install Buck & Boost transformer on A/C system	Manipulative	Job sheet Install Buck & Boost transformer on A/C system
5. Procedure for troubleshooting transformers	Rule learning	Slide/tape
6. Troubleshoot transformers	Manipulative	Troubleshoot 6 transformers (5 - control transformers - Buck & Boost

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-21

TASK Electrical Components

UNIT Installing and testing contacts and relays

OBJECTIVE(S)

Disassemble inspect, wire, and operate and troubleshoot contactors and relays.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Contactors & relays	Concept	Slide/tape
2, Contactors & relays	Discriminative	Assignment sheet
3. Construction of contactors & relays	Concept	Text assignment
4. Disassemble & inspect contactors & relays	Manipulative	Job sheet 1. Inspect sealed relay 2. Disassemble contactors & relays
5. Application & operation of relay & contactors	Concept	Text assignment
6. Procedure for installing a relay or contactor to operate a load	Rule learning	Slide/tape
7. Wire & operate relays & contactors	Manipulative	Job sheet a. Wire & operate relay to control light bulb with SP switch (110v coil) (Student should draw diagram) b, Wire & operate relay to control fan motor with SP switch (24v coil) (Student draws diagram) c. Wire & operate contactor to control compressor with SP swith (208v coil) (Using pictorals for guides)

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-21 (Cont'd)

TASK Electrical Components

UNIT Installing and testing contacts and relays.

OBJECTIVE(S)

Disassemble, inspect, wire, and operate and troubleshoot contactors and relays.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
8. Troubleshooting relay & contactors	Concept	Text assignment
9. Procedure for trouble-shooting relay & con tactors	Rule learning	Slide/tape
10. Troubleshooting relays & contactors	Manipulative	Job sheet a. Troubleshoot 3 relays b. Troubleshoot 2 relays in equipment circuits c. Troubleshoot 3 contactors d. Troubleshoot 2 contactors in equipment circuits

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-22

TASK Electrical Components

UNIT Installing and checking a thermostat

OBJECTIVE(S)

Install and troubleshoot thermostats.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Thermostat Principles	Concept	Text Assignment
2. Examine Thermostats	Manipulative	Job Sheet. Examine thermostats. A. List controlling elements and ranges.
3. Types of Thermostats	Concept	Text Assignment. Slide/tape.
4. Label Thermostats	Manipulative	Job Sheet. Examine Thermostats. A. List types and ranges.
5. Basic Thermostat Principles	Discriminative	Assignment Sheet
6. Line Voltage Thermostat Applications	Concept	Information Sheet
7. Install Line Voltage Thermostat	Manipulative	Job Sheet. Install line voltage thefmostat on 2 units (1- heat, 1 - cool).
8. Low Voltage Thermostat Design and Letter Designation	Concept	Text Assignment. Information Sheet.
9. Low Voltage Thermostat Letter Designation	Discriminative	Assignment Sheet
10. Install Low Voltage Thermostat	Manipulative	Job Sheet. Install low voltage thermostat on: 1-furnace 2-air conditioner 3-gas furnace and electric air conditioner
11. Anticipators	Concept	Text Assignment. Information Sheet (guid sheet).

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-22 (Cont'd)

TASK Electrical Components

UNIT Installing and checking a thermostat

OBJECTIVE(S)

Install and troubleshoot thermostats.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
12. Anticipators	Discriminative	Assignment Sheet
13. Set Heating and Cooling Anticipator	Manipulative	Job Sheet 1. Set heating anticipator on: a. gas heat b. oil heat c. electric heat 2. Check cooling anticipator
14. Staging Thermostat	Concept	Text Assignment
15. Install 2 Stage Conditioner, 2 Stage Heat Stat and 1 Stage Cool - 2 Stage Heat - on Heat Pump	Manipulative	Job Sheet 1. Install 2 stage cool - 2 stage heat thermostat 2. Install 1 stage cool - 2 stage heat thermostats on heat pump
16. Procedure for Installing Clock Thermostat	Rule-learning	Slide/tape
17. Install Clock Thermostat	Manipulative	Job Sheet. Install clock thermostat.
18. Procedure for Servicing Thermostat	Rule-learning	Slide/tape.
19. Troubleshoot Thermostats	Manipulative	Job Sheet. Troubleshoot 5 systems with thermostat problems.

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-23

TASK Electrical Components

UNIT Installing and checking a pressure switch

OBJECTIVE(S)

Adjust pressure switch to specifications and troubleshoot pressure switch.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Pressure Switches Principles	Concept	Text Assignment (Slide/tape)
2. Examine and Record Ranges of Pressure Switches	Manipulative	Job Sheet a. Examine pressure switches b. List ranges and types
3. Pressure Switch Principles	Discriminative	Assignment Sheet
4. Pressure Switches Used as Safety Controls	Concept	Text Assignment. Information Sheet.
5. Procedure for Setting a HPS and LPS for Safety Control	Rule-learning	Slide/tape
6. Set HP and LP for Safety Control	Manipulative	Job Sheet. 1. Set LPS for safety control in F-12, F-22, and F-500 system 2. Set HPS for safety control on F-12, F22 and F-500 for air control and water cooled units
7. Pressure Switch Used as Operating Controls	Concept	Text Assignment. Information Sheet.
8. Procedure for Setting Low Pressure Switch for Operating Controls	Rule/learning	Slide/tape.

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-23 (cont'd)

TASK Electrical Components

UNIT Installing and checking a pressure switch

OBJECTIVE(S)

Adjust pressure switch to specifications and troubleshoot pressure switch.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
9. Set LPS to Operate Walk-in-cooler and Refrigerator	Manipulative	Job Sheet. Set LPS to operate walk-in-cooler.
10. Set Pressure Switches to Operate Special Devices	Manipulative	Job Sheet. 1. Set HPS to control CFM 2. Set LPS to control capacitor control.
. Procedure for Troubleshooting Pressure Switches.	Rule-learning	Slide/tape.
12. Troubleshooting Pressure Switches.	Manipulative	Job Sheet. Troubleshoot: 1. HPS as safety device 2. LPS as safety device 3. HPS as operating control 4. LPS as operating control

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-24

TASK Electrical Components

UNIT Trouble shooting an overload

OBJECTIVE(S)

Identify and troubleshoot an overload.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Overload Principles	Concept	Text Assignment
2. Overload Principles	Discriminative	Assignment Sheet
3. Identify Types of Overloads	Manipulative	Job Sheet. 1. Identify different types of overloads 2. Locate overloads on equipment
4. Thermal Overloads 1. Line Break and Pilot Duty	Concept	Information Sheet
5. Troubleshooting and Servicing Thermal Overloads	Manipulative	Job Sheet. Procedures on job sheet: 1. Troubleshoot line break overload 2. Troubleshoot pilot duty overload 3. Replace thermal overload
6. Magnetic Overloads	Concept	Information Sheet
7. Troubleshoot Magnetic Overload	Manipulative	Job Sheet. Procedures on job sheet: 1. Troubleshoot magnetic overload 2. Replace magnetic overload 3. Install lock out system with magnetic overload
8. Special Types of Overloads	Concept	Information Sheet 1. Internal compressor overload 2. Solid state overload with thermistors
9. Troubleshooting Special Types of Overloads	Manipulative	Job Sheet. Procedures on job sheet. 1. Troublshoot: a. Internal compressor overload b. Solid state overload c. solid state modules

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-25

TASK Electrical Components

UNIT Installing and checking miscellaneous controls

OBJECTIVE(S)

Install and troubleshoot sequencers, time delay relays, humidistats, oil safety controls and, time clocks.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Sequencers	Concept	Information Sheet
2. Sequencers	Discriminative	Assignment Sheet
3. Install and Troubleshoot Sequencers	Manipulative	Job Sheet. 1. Install sequencers on electric furnaces 2. Troubleshoot sequencers
4. Time Delay Relays	Concept	Information Sheet
5. Install and Troubleshoot Time Delay Relays	Manipulative	Job Sheet. 1. Install time delay relay 2. Troubleshoot time delay relay
6. Humidistats	Concept	Information Sheet
7. Install and Troubleshoot Humidistat	Manipulative	Job Sheet. 1. Install humidistat 2. Troubleshoot
8. Oil Safety Controls	Concept	Information Sheet
9. Oil Safety Controls	Discriminative	Assignment Sheet
10. Procedure for Troubleshooting and Installing An Oil Safety Control	Rule-learning	Slide/tape
11. Troubleshoot and Install Oil Safety Control	Manipulative	Job Sheet. 1. Install oil safety switch 2. Troubleshoot safety switch
12. Time Clocks	Concept	Information Sheet

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-25 (cont'd)

TASK Electrical Components

UNIT Installing and checking miscellaneous controls

OBJECTIVE(S)

Install and troubleshoot sequencers, time delay relays, humidstats, oil safety controls and, time clocks.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
13. Set, Troubleshoot, and Install Time Clock	Manipulative	Job Sheet. 1. Install and set time clock 2. Troubleshoot time clock.
14. Review	Discriminative	Assignment Sheet.

MAJOR BLOCK ELECTRICITY **UNIT NUMBER** EL-26

TASK Electrical Components

UNIT Troubleshooting magnetic starters

OBJECTIVE(S)

Disassemble, install and troubleshoot a magnetic starter.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Magnetic Starter Principles	Concept	Slide/tape. Information Sheet.
2. Magnetic Starter Principles	Discriminative	Assignment Sheet.
3. Disassemble Magnetic Starter	Manipulative	Job sheet. Disassemble magnetic starter.
4. Procedure for Installing Magnetic Starter with Simple Control	Rule-learning	Slide/tape
5. Install Magnetic Starter	Manipulative	Job Sheet. Install magnetic starter controlled by toggle switch.
6. Types of Push Buttons	Concept	Information Sheet.
7. Install Magnetic Starter with Push Button	Manipulative	Job Sheet. 1. Install magnetic starter with push button. 2. Install magnetic starter with push button.
8. Procedure for Troubleshooting Magnetic Starter	Rule-learning	Slide/tape
9. Troubleshoot Magnetic Starter	Manipulative	Job Sheet. 1. Troubleshoot magnetic starter with push button. 2. Troubleshoot magnetic starter with thermostat.

MAJOR BLOCK Electricity **UNIT NUMBER** EL-27

TASK Controls & Installation

UNIT Wiring packaged air conditioners

OBJECTIVE(S)

Size and install wire for packaged air conditioning unit.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types of packages	Concept	Slide/Tape
2. Examine packaged A/C system	Manipulative	Examine package A/C systems & answer questions (1-packaged unit) (1-gas/elec. unit)
3. Electrical components & control systems for packaged air condition system	Concept	Text assignment Information Sheet
4. Procedure for sizing & installation wire to a package A/C system (including control wire)	Rule learning	Slide/Tape Information Sheet
5. Size wire for package wire	Manipulative	Size wire for 2 package unit
6. Install wire for package unit	Manipulative	Install wire for 2 package A/C systems

MAJOR BLOCK Electricity **UNIT NUMBER** EL-28

TASK Controls and Installation

UNIT Wiring split system air conditioner

OBJECTIVE(S)

Size and install wire for a split system air conditioning unit.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types of split A/C systems	Concept	Slide/Tape
2. Examine split A/C systems	Manipulative	Examine 4 split A/C systems & answer questions: 1-Gas furnace 1-Oil furnace 1-Fan coil unit 1-Counterflow furnace
3. Electrical componants & control systems for split A/C systems	Concept	Text assignment Information Sheet
4. Procedure for sizing & installing wire to A Cond unit of A split system (including control wiring)	Rule learning	Slide/Tape -- Use one Information Sheet
5. Size wire for Cond unit	Manipulative	Size wire for Z cond. unit (including 1 A/C system with fan W-1)
6. Install wire for Cond unit	Manipulative	Install wire for 2 split A/C system (1-Fan coil unit inst. 1-Furnace installation)

MAJOR BLOCK Electricity **UNIT NUMBER** EL-29

TASK Controls & Installation

UNIT Designing control panel (will include wiring boards)

OBJECTIVE(S)

Design a basic wiring diagram and install wire on board or wire control panel.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Install wiring on electrical board #100 from diagram	Manipulative	Install necessary wiring to electrical board #100 for proper operation
2. Draw wiring diagram for control panel to meet specifications A	Manipulative	Draw wiring diagram to meet specification A
3. Install components on board & wire control panel A	Manipulative	Install components on board & wire control panel A
4. Draw wiring diagram for control panel to meet specification B	Manipulative	Draw wiring diagram to meet specifications B
5. Install components on board & wire control panel	Manipulative	Install components on board & wire control panel B

MAJOR BLOCK Electricity **UNIT NUMBER** EL-30

TASK Controls & Installation

UNIT Designing advanced control panel (will include wiring boards)

OBJECTIVE(S)

Design an advanced diagram and install wire on board or wire control panel.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Install wiring on electrical board #101 from diagram	Manipulative	Install necessary wiring to electrical board #101 for proper operation
2. Draw wiring diagram for control panel to meet specifications C	Manipulative	Draw wiring diagram to meet specifications C
3. Install components on control panel to meet specification D	Manipulati	Install components & wire control panel C
4. Draw wiring diagram for control panel to meet specification D	Manipulative	Draw wiring diagram to meet specifications D
5. Install components on Board & wire control panel D	Manipulative	Install components & wire control panel D

MAJOR BLOCK Electricity **UNIT NUMBER** EL-31

TASK Controls and Installation

UNIT Trouble shooting electrical control system (basic)

OBJECTIVE(S)

Troubleshoot electrical components, circuits, and basic A/C control systems.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Review of troubleshooting components	Rule learning	Slide/Tape
2. Troubleshoot electrical components	Manipulative	Troubleshoot 20 electrical components
3. Systemmatic procedure for troubleshooting circuits	Rule learning	Text Assignment Slide/Tape
4. Troubleshoot circuits	Manipulative	Troubleshoot 5 electrical circuits.
5. Systematic procedure for troubleshooting control system	Rule learning	Information sheet Text assignment
6. Troubleshoot A/C systems (basic)	Manipulative	Troubleshoot at least 5 basic control systems

MAJOR BLOCK Electricity **UNIT NUMBER** EL-32

TASK Controls and Installation

UNIT Troubleshooting electrical control system (advanced)

OBJECTIVE(S)

Troubleshoot electical components, circuits, and advanced A/C control systems.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Advanced control systems	Concept	Text assignment
2. Control systems	Discriminative	Answer question Assignment sheet
3. Systematic procedure for troubleshooting advanced control systems	Manipulative	Troubleshoot at least 5 advanced control system.

MAJOR BLOCK Electricity **UNIT NUMBER** EL-33

TASK Controls and Installation

UNIT Servicing Solid State Control Circuits

OBJECTIVE(S)

Servicing Solid-State Control Circuits

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Solid-state devices used in heating and air conditioning control circuits.	Concept	Information Sheet -Introduction: Rationale for using solid state -- Keep down cost of operation of controls -- Increases the range of control features possible -Some terms used to indicate solid-state devices: --Mini-computer --Logic board --Printed circuit board --Chip --IC's --Chip board --Module -Illustrate and describe solid-state components -Illustrate symbols and their identification in wiring diagrams. -Symptoms of solid-state component failure: Compare to conventional control circuits; analyze "ins and outs" -Test equipment and testing procedures. --Manufacturers' fault isolation "box" --High resistance voltmeters --Continuity checks --Caution concerning danger of shorting across contacts of IC's.
2. Identifying solid-state	Rule-learning	Slide/Tape -Illustrate and describe solid-state components

MAJOR BLOCK Electricity **UNIT NUMBER** EL-33 (cont'd)

TASK Controls and Installation

UNIT Servicing Solid State Control Circuits

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
		-The repair or replace decision -- Solid state devices usually damaged by failure of other system components. Assure these are repaired before installing a new component. -- If damage is visibly evident have repair of the device estimated by an electronic service center which is equipped to do high reliability soldering. -- Compare cost of rework of device with cost of replacement and inform customer. Final decision is that which satisfies. Time, cost, reliability considerations.
3. Identifying solid-state devices and solid-state servicing procedures	Concept/Manipulation	Assignment Sheet -Recall terms used to indicate a component is a solid-state device or component. -Recall usual purpose and in-circuit location of solid-state devices. -Recall advantages of manufacturer's whole system tester. -Recall limitation of high resistance voltmeter and continuity testers. -Recall major factors to consider in making the repair or replace decision. -Recall assurance "outside" circuit is cleared of faults before replacing solid-state device. -Recall caution of avoiding shorting of component lead during testing. -Instructor check.

MAJOR BLOCK Electricity **UNIT NUMBER** EL-33 (cont'd)

TASK Controls and Installation

UNIT Servicing Solid State Control Circuits

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
		--Use conventional circuit components as "Knowns" for purpose of comparison -Describe normal operation of control devices -Describe symptoms of faulty operation --Those indicating the input is abnormal --Those indicating the output is abnormal --Timing of fault in relation to normal sequence --What steps are missing? --What action is new, that is caused by the fault? -Analyze symptoms using an evaluation process in which your knowledge of a correct operating system is used as the standard for comparing the observed fault symptoms and operating conditions. -Test equipment and testing procedures --Examples of product manufacturer's system alignment and fault isolation tester. ---Specialized - High use justifies investment. ---Time saving, and standardizes testing procedure. --High Resistance Voltmeter ---Useful for checking ins and out but very limited for in circuit test. --Continuity Tester. ---Useful on high current circuits only --Caution concerning danger of shorting across component leads when using test probes.

MAJOR BLOCK Electricity **UNIT NUMBER** EL-33 (cont'd)

TASK Controls and Installation

UNIT Servicing Solid State Control Circuits

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
4. Servicing solid-state control circuits	Manipulation	Job Sheets (3) A- Using a whole-system tester, test for correct operation of a solid-state control. - Analyze findings - Make repair or replace decision - Repair as necessary. - Instructor check. B- Using a high resistance voltmeter, test for correct operation of a solid-state control. - Analyze findings - Make repair or replace decision - Repair as necessary - Instructor check. C- Using a continuity tester, test for correct operation of a solid-state control. - Analyze findings - Make repair or replace decision - Make repairs as necessary - Instructor check.

MAJOR BLOCK

REFRIGERATION

REF 1	--	REF 38	Secondary
REF 1	--	REF 25	Post Secondary

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-01

TASK Refrigeration Fundamentals

UNIT Identifying career opportunities in Refrigeration, Heating and A/C

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. History of refrigeration	Concept	Information Sheet
2. Modern application of refrigeration system	Concept	A/V Assignment Sheet - identify and name as many refrigeration systems as you (student) have come in contact with.
3. Opportunities in the Heating & A/C	Concept	Information Sheet
4. Course outline and sequence		Information Sheet

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-02

TASK Refrigeration Fundamentals

UNIT Identifying Safe Working Conditions

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. General shop safety	Concept	Slide/Tape
2. Fire extinguisher	Concept	Information Sheet (See SAMS Manual)
3. Review	Discriminative	Assignment Sheet (Questions)
4. First Aid	Concept	Information Sheet (Basics)
5. Emergency Actions	Discriminative	Assignment Sheet [Decision making in at least 6 emergency situations (written)]
6. Electrical safety	Concept	Information Sheet (Rules) Slide/Tape (Examples)
7. Refrigeration safety	Concept	Information Sheet (Rules) Slide/Tape (Examples)
8. Trade safety	Discriminative	Assignment Sheet (Questions)
9. Safety inspection	Manipulative	Job Sheet (Make safety inspection of shop)

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-03

TASK Refrigeration Fundamentals

UNIT Understanding Basic Refrigeration Concepts

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Basic refrigeration concepts	Concept	Information Sheet (define: refrigeration heat, cold, temperature)
2. Molecular theory	Concept	Slide/tape (define: heat, molecular motion, 3 states of matter, charges of state, etc.)
3. Heat measurement	Concept	Text Assignment (define: sensible heat, latent heat, specific heat, temperature, °F, °C, conversion, Btu, example of Btu problems)
4. Heat laws	Concept	Information Sheet
5. Review	Discriminative	Assignment Sheet
6. Heat calculations	Manipulative	Job Sheet (calculate amount of heat rejected from water)
7. Pressure	Concept	Text Assignment (define: pressure, PSIA, PSIG, Vacuum - pressure relationship (gas law)
8. Effect of pressure on objects	Manipulative	Job Sheet - boil water w/vacuum and inflate balloon raise temperature of ref cylinder and measure pressure (w - hot water)

MAJOR BLOCK REFRIGERATION UNIT NUMBER REF-04

TASK Refrigeration Fundamentals

UNIT Understanding the basic refrigeration cycle

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Basic refrigeration	Concept	Slide/tape
2. Brief description of components and purpose	Concept	Information Sheet
3. Basic refrigeration concepts	Discriminative	Assignment Sheet (Questions)
4. Refrigerant flow in system	Concept	Text Assignment or Information sheet (whichever works best) Slide/tape
5. Refrigeration cycle	Concept	Information sheet to go along with Travis
6. Refrigeration cycle flow	Manipulative	Job Sheet (explanation to instructor)
7. Refrigeration cycle applications	Concept	Slide/tape
8. Applications	Manipulative	Job Sheet - explain refrigeration cycle of at least 4 applications

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-05

TASK Refrigeration Fundamentals

UNIT Identifying Tools

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Basic hand tools	Concept	Text Assignment
2. Using basic hand tools	Rule Learning	Slide/tape (last 10 slides discrimination between tools - may use an assignment sheet in conjunction with the A/V)
3. Electric tools	Concept	Information Sheet
4. Using electric tools	Rule Learning	Slide/tape
5. Using electric tools	Manipulative	Job Sheet (1. Make assembly) (2. Use grinder)
6. Refrigeration tools	Concept	Text Assignment
7. Special testing and recording equipment	Concept	Text Assignment
8. Identify and examine tools	Manipulative	Job Sheet

MAJOR BLOCK REFRIGERATION UNIT NUMBER REF-06

TASK Refrigeration Fundamentals

UNIT Tapping, threading, and replacing threads

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types of threads and materials	Concept	Information sheet
2. Types of assembly devices	Concept	Information sheet
3. Identify screws, nuts and bolts	Discriminative	Assignment Sheet (identify when to use)
4. Examine screws, nuts, bolts	Manipulative	Job Sheet (label as to threads, size and nonenclatures)
5. Taps and dies	Concept	Text Assignment
6. Procedure for tapping, threading and reparing threads	Rule Learning	Slide/Tape
7. Tapping and threading	Manipulative	Job Sheet (Tapping and threads)
8. Repair threads	Manipulative	Job Sheet Remove booker bolt Repair threads

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-07
TASK Refrigeration Fundamentals
UNIT Fitting Nomenclature & Pipe Materials
OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types of pipe and fittings a. copper tubing b. copper pipe c. joining copper tubing d. steel pipe e. joining steel pipe f. PVC pipe g. joining PVC pipe	Concept	Information Sheet
2. Identify and examine types of pipe	Manipulative	Job Sheet a. types of pipe b. joining pipe c. discrimination between types of pipe d. size
3. Flare fittings	Concept	Job Sheet
4. Identify flare fittings f. ells - f. plugs - f. nut - f. tee - f. cap half union -	Manipulative	Job Sheet (identify 25 fittings and size)
5. Sweat fittings ell, tec, st.Ell, adapters, coupling, reducing coupling, Bisky	Concept	Information Sheet
6. Identify sweat fittings	Manipulative	Job Sheet (identify 25 fittings & size)
7. Steel fittings	Concept	Information Sheet
	Manipulative	Job Sheet (identify 25 fittings & size)

MAJOR BLOCK ______________________ UNIT NUMBER REF-07 (cont'd)

TASK ______________________

UNIT ______________________

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
8. Identify steel fittings ell, tee, st. ell, union coupling, red coupling, bushing	Manipulative	Job Sheet (identify 25 fittings and size)
9. PVC fittings	Concept	Information sheet
10. Identify PVC fittings (ell, tee, coupling, male adapt, female adapt)	Manipulative	Job Sheet (Identify 5 fittings and size)
11. Identify fittings	Manipulative	Job Sheet (identify 30 fittings & size)

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-08

TASK Tubing & Pipe

UNIT Basic copper tubing operations (Flaring, cutting, bending, swedging)

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Tools used with copper tubing and procedures	Concept	Slide/tape (large and small tubing cutters, reamer, flaring tool [two types], swedging tool [two types].
2. Cutting, reaming, (Flaring) and swedging copper tubing	Manipulative	Job Sheet a. include enough procedure for student b. art copper tubing c. flare copper tubing and check for leak d. swedging copper tubing - keep for soldering
3. Bending copper tubing and procedure	Concept	Slide/Tape Information Sheet - procedures for bending
4. Bend copper tubing	Manipulative	Job Sheet

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-09

TASK Tubing & Piping

UNIT Soft soldering copper tubing

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Torches (prestolite and turbo torch)	Concept	Information Sheet - cover torch, tank tips and how to light.
2. Light torches	Manipulative	Job Sheet - Procedure on how to light and how to turn torch off.
3. Types of solder (50/50, 95/5 and fluxes, silver bearing (sta-brite), silfos, silver solder	Concept	Information Sheet - covering melting temps and where and when to use each type (applications)
4. Prep of pipe (fitting, etc.)	Rule Learning	Information Sheet - how to prepare surface
5. Procedure for soldering	Rule Learning	A/V - start with basics of preparing surface, then give actual start to finish procedures for soft solders Job Sheet - procedures for using 50/50, 95/5 and sta-brite. Student should do at least 3 joints of vertical horizontal and inverted of 1/4, 1/2, 5/8 and one larger size copper tubing using each type solder

MAJOR BLOCK Refrigeration **UNIT NUMBER** REF-10

TASK Tubing & Piping

UNIT Silver Brazing

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. oxy-acetlyene torches	Concept	Information - cover torch tank tips and how to light
2. Using torches	Manipulative	Job Sheet - light torch and cut off
3. Brazing concepts	Concept	Information sheet - (Harris welding supply has booklet which is good for information sheet). Definition of Brazing (tell difference between brazing and soldering in terms of temperature, equipment, and where used. Flux). Brazing refers to silfos and soldering.
4. Procedure for brazing	Rule Learning	A/V - start with basics of preparing surface, then give actual start to finish procedures for silver brazing. Job Sheet - procedures for using silver solder and silfos. Student should do at least 1 joint of vertical, horizonta and inverted of 1/4, 3/8, 1/2, 5/8 and one larger size copper tubing using silfos and silver solder. Student should do following jobs: steel to brass, steel to copper, brass to copper, cast iron to brass, cast iron to copper, cast iron to steel
. Problem in Soldering and Brazing	Manipulative	Job Sheet - Create unit from blueprint diagram

MAJOR BLOCK Refrigeration **UNIT NUMBER** REF-11

TASK Refrigerants

UNIT Handling refrigerants

OBJECTIVE(S)

Determine types of refrigerants and where they are used

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Requirements for refrigerants	Concept	Text Assignment Modern R/A/C (277)
Groups of refrigerants	Concept	Assignment Sheet (list at least two refrigerants in each group) Three groups
2. Group #1 (Most commonly used)	Concept/ Discriminative	Text Assignment 297 sec. 9-29; 9-30 Assignment Sheet 1. Color codes 2. Application 3. Determine temp. and pressure from chart
		Page 297 Modern R/A/C chart on assignment sheet
3. Group II (Toxic)	Concept Discrimination	Job Sheet - Have student determine pressure and temp in a drum and report on type of refrigeration cylinder
4. Group III (Combustible)	Concept	Text Assignment Self Check
Safety	Concept	Assignment Sheet
5. Procedure for filling service cylinder	Rule learning	Slide/tape (Maybe slide tape on safety)
(Heating and cooling safety)		Job Sheet - fill a service cylinder Job Sheet - determine what type of refrigerant is in a unit.

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-12

TASK Refrigerants

UNIT Using access valves

OBJECTIVE(S)

Examine, disassemble, assemble and operate access valves.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Purpose of access valves	Concept	Information sheet
2. Types of access valves	Discrimination	Slide presentation
3. Low side and high side service valve	Concept Discrimination	Text assignment/Information sheet Examine from an assortment
	Manipulation	Disassemble and reassemble
4. Liquid receiver service valve	Concept	Text assignment/information sheet
	Manipulation	Disassemble/reassemble
5. Shrader service valve	Concept	Text assignment
6. Install service valve	Manipulation	Install,disassemble, reassemble Job sheet
7. Special valves (Saddle piercing valve)	Concept	Information sheet
Process tube adapter	Manipulation	Install--Job sheet

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-13

TASK Refrigerants

UNIT Maintaining refrigeration manifold gauge

OBJECTIVE(S)

Maintain and properly care for the gauge manifold assembly.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types and construction of pressure gauges	Concept	Information sheet (illustration of gauges showing) General information 1. Compound (low side) 2. High pressure (high side)
2. Reading pressure gauges	Discrimination/ Manipulation	Assignment sheet (Given a gauge without a needle, allow student to draw in given readings.)
3. Read gauges	Manipulation	Job sheet Lock gauges in position (211-4-1) 1. Comp. 29" hg. 2. High pressure 29 press Read gauges more than once have five different settings for each type of gauge.
4. Manifold operation	Concept	Information sheet (Cutaway of manifold)
5. Procedure for disassembly and reassembly	Rule Learning	Slide/tape
6. Disassemble & reassemble manifold	Manipulation	Job sheet (Procedure-exploded view)
7. Maintenance & care of hoses	Concept	Information sheet
8. Construct the manifold gauge assembly	Manipulation	Job sheet (Be sure to include calibration).

MAJOR BLOCK Refrigeration **UNIT NUMBER** REF-14

TASK Refrigerants

UNIT Installing and using refrigeration manifold gauges

OBJECTIVE(S)

Install and use refrigeration gauge manifold

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Methods of installation	Concept	Information Sheet 1. Return refrigerant to system method 2. Short 3. Schrader valves 4. Piercing valves Audio Visual - on procedures involved in installation
2. Procedures to install and remove manifold gauges	Rule learning	Assignment Sheet 1. Questions on proper installation and removal Job Sheet - refering to trainers, etc.
3. Expected ranges of procedures (ideal design conditions)	Discrimination	Information Sheet Self Check Job Sheet - Assign several live units for students to get pressure readings from, using all types of valves.

MAJOR BLOCK Refrigeration **UNIT NUMBER** REF-15

TASK Refrigerants

UNIT Using a vacuum pump

OBJECTIVE(S)

Use the vacuum pump to evacuate the system to 250 microns or less

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Principles of evacuation	Concept	Information Sheet Millimeters of mercury microns (James Bussey, Dupont Book)
2. Methods of evacuation	Concept	Text Assignment (Modern R/A/C, 384)
	Concept	Information Sheet
	Discrimination	Assignment Sheet
3. Types of vacuum pumps	Concepts	Text Assignment
4. Use of vacuum pumps	Discrimination	Assignment Sheet (Matching items to application single stage two stage high capacity
		Job Sheet - Student can discriminate different types and measure vacuum on each type
5. Special component equipment used in evacuation	Concept	Information Sheet 1. High vac gauge High vac tube 2. Cold trap if used 3. Mercury manometer
	Discrimination	Assignment Sheet
		Job Sheet - Student can actually use high vac gauge, high vac tube, and mercury manometer and perform cold trap water removal process
6. All the components in use	Rule learning	Slide/tape on using the various components and vacuum pump. (include bell jar demo)
7. Evacuate the system to 250 microns or less	Manipulative	Job Sheet (Including procedures) Should vacuum using both the deep vacuum and a multiple vacuum

MAJOR BLOCK Refrigeration **UNIT NUMBER** REF-16

TASK Refrigerants

UNIT Installing refrigeration accessories

OBJECTIVE(S) Upon completion of this unit, the student will be able to install according to manufacturer's specifications, refrigeration accessories such as: dryers, isolation valves, accumulators, and pressure relief solenoid valves.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types of dryers sight glasses check valves	Concept	Text Assignment or Information Sheet
2. Isolation valves accumulators pressure relief solenoid valves	Discrimination (Include all in one group)	Assignment Sheet (where used, etc.) Assignment Sheet can include discrimination between dryers and sight glasses and check valves.
	Rule learning	Audio visual (dryers: why, where, use, size)
	Manipulative	Job Sheet (Examine above components and label)

*Each item probably need Information Sheet or Text Assignment.

MAJOR BLOCK Refrigeration UNIT NUMBER REF-17

TASK Refrigerants

UNIT Testing for leaks

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Type of leak (Detection available)	Concept	Text Assignment 361-363
2. Detection of leaks	Discrimination	Assignment Sheet
Soap Solution (Halied torch) Electronic lead detection	Emphasize safety	
Dye (hit lightly) Sight (Oil signs) Vacuum method		Audio visual 1. Listen 2. Indication of oil 3. Electronic leak 4. Bubble solution 5. Halide torch
		Job Sheet (Find leaks using all three major methods)
		(If a good text assignment is not available, write an information sheet)

MAJOR BLOCK Refrigeration **UNIT NUMBER** REF-18
TASK Refrigerants
UNIT Charging System
OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types of charging methods	Concept	Information Sheet Frost-line Dial-a-charge Weight Ref. (Ch. 9 in Modern R/H/A) 296-300 Pressure and Temperature Super heat Include information about temperature (high, medium, low)
2. Application of types to	Discrimination	Assignment Sheet Low side (vapor, illustration) Explanation. High side (liquid, illustration) Explanation. Questions to apply methods of charging to low and high side charges. Student should be given operating temperatures of a unit and type of refrigerant. He must determine what the proper charge should be.
3. Procedures in charging	Rule learning	Slide/tape Charge - sight glass Dial-a-charge Weight method Pressure temperature Super heat Information Sheet Outlining the procedures used in charging a system (Same as in the A/V)
4. Charge Unit	Manipulative	Charge system with vapor in low side and check with (two of above methods to check) Job Sheet should require three systems (high, medium and low)

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-19

TASK Troubleshooting

UNIT Testing the compressor

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types of compressors Reciprocal Rotory Centrificual Screw Hermetic and Semi Hermetic Open comp	Concept	Information Sheet
2. Reciprocal	Concept	Text Assignment
3. Mechanicals problems in reciprocal	Discriminative	Assignment Sheet Symptoms Problems Troubleshooting
4. Procedures in trouble-shooting compressor	Rule learning	Slide/tape What is wrong, problems diagnosis repair and replacement
5. Troubleshoot Hermetic		Job Sheet
6. Disassemble and reassemble semi-hermetic compressor	Manipulative	Job Sheet Exploded illustration with components identified and step by step procedure for disassembly. (Examine and clean)

MAJOR BLOCK Refrigeration **UNIT NUMBER** REF-20
TASK Troubleshooting
UNIT Applying principles of condenser
OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types of condensers Fin & tube Shell & tube Lube & tube	Concept	Text Assignment
2. Application Static Air Fan Air Water (Servicing condenser dirt, fin condition)	Concept	Information Sheet Different Applications
3. Application and Maintenance	Discriminative	Assignment Sheet What condensor does different application.
4. Locate and identify condensor	Manipulative	Job Sheet [Locate eight (model and serial number) applications of condensors in lab]

MAJOR BLOCK	Refrigeration
UNIT NUMBER	REF-21
TASK	Troubleshooting
UNIT	Applying principles and uses of the evaporator
OBJECTIVE(S)	

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types of evaporators	Concept	Text Assignment Fin & tube Plate
Repeat the steps on condensor on No. 2.		

MAJOR BLOCK Refrigeration **UNIT NUMBER** REF-22

TASK Troubleshooting

UNIT Trouble shooting an automatic expansion valve

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Automatic expansion valve	Concept	Information Sheet p. 110 Para. 4-19 Modern R/H/A
	Concept	Text Assignment p. 141-144 Para. 5.2-5.6
Types of expansion valves	Discriminative	Assignment Sheet (Illustrations to identify types and questions concerning operating principles)
Identify valves		Job Sheet (Examine valves in shop)

MAJOR BLOCK Refrigeration **UNIT NUMBER** REF-23

TASK Troubleshooting

UNIT Applying principles of troubleshooting capillary tubes

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Capillary tubes	Concept	Information Sheet Par. 4-18 p. 105 B.1
	Concept	Text Assignment p. 164-65 Par. 5-26 5-29
Application of capillary tube	Discriminative	Assignment Sheet Questions, How do you cut a capillary tube?
Procedures on where to use cut splice and repair capillary tube	Rule learning	Slide/tape Job Sheet Locate six capillary tubes 1. Single feed 2. Dual feed 3. Multi-feed Cut a capillary tube and make repair

MAJOR BLOCK Refrigeration **UNIT NUMBER** REF-24

TASK Troubleshooting

UNIT Trouble shooting thermostatic expansion valve

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Thermostatic expansion valve	Concept	Information Sheet B-1 4-20 p. 110
Types of valves	Concept	Text Assignment 5-7 p. 145 5-8 148 (Figure 5-8)
Components of TEV	Discriminative	Assignment Sheet Label illustration of TEV
Bulb charge (types)	Concept	Text Assignment 5-9 5-14 p. 148-152
144-161 Spartan Bulletin		

MAJOR BLOCK	Refrigeration
UNIT NUMBER	REF-25
TASK	Troubleshooting
UNIT	Trouble shooting the refrigeration system
OBJECTIVE(S)	

This package will consist of check list for each item of details. May not be finished at one time.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Diagnose refrigeration cycle problems	Problem Solving	Job Sheet Diagnose four problems
Make repairs	Problem Solving	
Evacuate system	Problem Solving	
Charge system	Problem Solving	
Run and test system		

MAJOR BLOCK Refrigeration **UNIT NUMBER** REF-26

TASK Window Air Conditioning

UNIT Installation of a Window Unit

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Identifying location and purpose of components	Concept	Assignment Sheet A-V (Match picture components with name)
2. Installation of a window A/C	Concept	Information Sheet A/V
	Manipulative	Job Sheet
Demonstrating the window unit and informing of preventive maintenance	Concept	Information Sheet A/V which will include explain how to clean coils and filter, watch shrubs make sure they are not restricting air flow to condenser smae with drape and furniture with evaporator on inside. Also make sure they use proper fuse

Additional Units

Installation - Components/system (electrical & mechanical)
Basic parts
Purpose - now it is different from central

electrical

- wiring diagram
- switches
- capacitors
- thermostat (tube & bimetal)
- fan motor (location)
- compressor

mechanical

- coils
- evaporator
- condensor
- metering device
- filter

Customer Relations - tell how to
- shrubs or wall filter outside dose to condenser (restriction) (restrictions to intake or exhaust)
- filters must be clean
- furniture and drapes to dose to evaporator
- proper fuses

MAJOR BLOCK Refrigeration **UNIT NUMBER** REF-27

TASK Window Air Conditioners

UNIT Performing Pre-season start up for window A/C

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Pre season start up	Concept	Information Sheet (why, when, customer relations, equipment care).
2. Procedure for pre-season start up	Rule learning	Slide presentation (visual inspection, removal of unit clean coils and fan, tube clean or replace filter, re-install seal window and unit, check bracing, straighten fins, start up and check charge (check proper operation)
Procedure	Discriminative	Assignment sheet
3. Perform pre-season start up	Manipulative	Job sheet (procedures, illustration)

MAJOR BLOCK Refrigeration **UNIT NUMBER** REF-28

TASK Window A/C

UNIT Troubleshooting compressor burn out in a window A/C

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Causes of compressor burn out	Rule learning	Information sheet w/illustrations, faulty wiring (in correct, under size) improperly fused, voltage lightning, overload, faulty and improperly wired capacitors, faulty over loads, mechanical failute, overload
2. Testing compressor windings	Rule learning	Information sheet (Procedure)
	Manipulative	Job Sheet
	Discriminative	Slide set - visual, using test meters, continuity check with VOM use apm meter on high amps, (safety note - acid)
	Concept	Information Sheet
3. Replace compressor	Manipulative	Job Sheet - remove old compressor flush condenser out with type of reg. that is in system, install new compressor, install liquid line dryer - section line dryer, evacuate leak check, replace capacitors if need and related electrics, charge, check for proper operation
4. Seal Unit	Concept	Information sheet
	Manipulative	Job Sheet

MAJOR BLOCK Refrigeration **UNIT NUMBER** REF-29

TASK Window Air Conditioners

UNIT Evacuating & Charging a Window A/C Unit

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. When/why to evacuate/ charge a system	Concept	Information Sheet w/illustrations of difference in humidities.
2. Discriminate between high side/low side	Discriminative	Assignment Sheet (to illustrate difference between suction, discharge)
3. Evacuate and charge the unit	Manipulative	Job Sheet Information sheet including: install access valve, install manifold gauges, hood up vacuum pump, evacuate system (check for leaks using vacuum method), charge the unit (using frost line or other charging method), seal the system, check system for proper operation

MAJOR BLOCK Refrigeration UNIT NUMBER REF-30
TASK Window Air Conditioning
UNIT Troubleshooting fans and fan motor
OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Determining type of motor	Discriminative	Information sheet (show wiring diagrams and determine which)
2. Check for mechanical failure	Concept	Information sheet A/V (Check bearings, check blade for restrictions)
	Manipulative	Job Sheet
3. Check for electrical failure	Concept	Information sheet, A/V (check for faulty wire--visual check using meter, check switch for v., continuity, sound, check test cord, visual meter check of capacitor, check polarity of capacitor
		A/V for 2 & 3
4. Replace motor concept	Concept	Information sheet, A/V Put note in T.G. that experience has shown replacement is not economical in shop practice on the same unit.

MAJOR BLOCK	Refrigeration
UNIT NUMBER	REF-31
TASK	Window Air Conditioning
UNIT	Troubleshooting Window Air Conditioners (refrigeration cycle)
OBJECTIVE(S)	

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Check for proper operation	Manipulative/ Concept	Information sheet, observation dry bulb, wet bulb, temperature drop, visual to check for sweat, oil. Job sheet (check off sheet)
2. Gain access to refrigeration system of the unit	Manipulative	Information sheet on gain access and check for proper chg. check for non-condensable gases, restrictions and mech failre of compressor, also includes pressure differential and vacuum check, proper refrigerant if entered before, after each symptom is discussed then the procedure for repair will be given - if repair procedures are not given in another portion then they will be given here A/V Job sheet will contain checklist of activities

MAJOR BLOCK REFRIGERATION UNIT NUMBER REF-32

TASK Window Air Conditioning

UNIT Troubleshooting window A/C electric system

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Wiring diagram	Concept	Information sheet (familiarization and apply knowledge)
	Manipulative	Job Sheet - using wiring diagram to check out system
2. Switch	Concept	Information sheet - rotary and push button, how check continuity understand mechanical operation A/V on above Job sheet - check different types of switches for continuity
3. Thermostat	Concept	Information sheet, how it works and how to check it Job sheet - actually checking out with meter
4. Capacitor	Concept	Information sheet w/illustration and how it works
	Manipulative	Job sheet - check out with meters
5. General troubleshooting procedures	Concept	Information sheet
	Problem Solving	Job sheet - check out A/C - give student symptom (customer complaint) student will apply previous knowledge and skills

MAJOR BLOCK ______ UNIT NUMBER REF-32 (cont'd)

TASK ______

UNIT Troubleshooting window A/C electric system

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
		completely in operative check power source check rotar switch or push button switch compressor only runs check switch check capacitor check fan motor fan-motor only runs check switch check capacitor check compressor compressor runs & fan motor runs only on high check fan motor check switch compressor runs, fan doesn't check fan motor fan run capacitor switches and all connections fan runs on all speeds compressor doesn't check compressor windings connections thermostat switch (no compressor hum) fan runs all speeds compressor doesn't but hums check capacitor check leads check compressor terminals check switch

MAJOR BLOCK ____________ UNIT NUMBER REF-32 (cont'd)

TASK ____________

UNIT Troubleshooting window A/C electric system

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
		fan runs on some speeds; but does not on others - compressor runs check switch check fan motor leads compressor does not cycle and ice builds up check thermostat check coils check BTU size compressor cycles on overload check run capacitor check overload check amps check dirty coils

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-33

TASK Refrigeration & Freezers

UNIT Understanding basic operations of a refrigerator or freezer

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Determine correct operation of refrigerators and freezers	Concept	A/V - illustrations and information of how a unit works (suggested check point; teacher demonstraton on the operation)
2. Determine purpose and location of parts	Concept/ Discriminative	A/V exploded views of parts and their location (refrigeration cycle and main electrical) Information sheet - explaining the function of parts Assignment sheet - have student match parts to names Job Sheet - properly adjust thermostat adjust shelves, remove and clean grills, and maintenance

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-34

TASK Refrigerators and freezers

UNIT Evacuating and charging refrigerators and freezers

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Install access valve	Concept/Manipulative	Information sheet with illustrations on what the access valve is, how it works and how to install it on both rotary and reciprocating driven machines. A/V on the above Job sheet a. discriminate between compressors b. use compressor start cord c. name suc - dis d. 1st dis - 1st ret - 2nd dis e. install valve
2. Evacuate the system	Concept/ Rule Learning	Information sheet with illustrations, procedures to: a. evacuate - elec mtr merc. manometer b. leak detection Job sheet - evacuate a system
3. Charge the system	Concept/ Rule Learning	Information sheet with illustrations of and procedures for charging
	Manipulative	Job sheet - charge unit
4. Seal the system	Concept/ Rule Learning	Information sheet - illustrations and procedures for sealing the system also tell why its necessary Job Sheet - check for leaks and seal the system

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-35

TASK Refrigerators and Freezers

UNIT Troubleshooting refrigerators and freezers (refrigeration cycle)

OBJECTIVE(S)

Diagnose and repair the refrigeration cycle on refrigerators and freezers

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Check for proper operation	Concept/ Manipulative	Information Sheet - describes correct temp. correct pressure and ideal conditions of operation Job Sheet - check refrigerator or freezer for correct operation
2. Compressors	Concept	Information Sheet on all the types of compressors (with illustrations) on how to gain access
4. Test and repair or replace component parts	Concept/ Rule Learning	A/V covering: compressor check, capalliary tubes, condenser, leak detection, charge, moisture, dryer, etc. Information Sheet - check list covering above
	Manipulative	Job Sheet - instructor will bug and student will find problem and repair
5. Seal the system	Manipulative	Job Sheet - procedures and illustrations on how to seal and how to check for proper operation

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-36

TASK Refrigeration and Freezers

UNIT troubleshooting fans and fan motors

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Check for mechanical failure	Concept	Information Sheet - contain information on: restricted air flow, bad bearings, damaged blades A/V Procedures for checking for above* on unit *(items listed in information sheet)
2. Check for electrical failure	Concept	Information sheet - procedure using wiring diagram A/V - show what to look for, describe and show how to find problem systematically
	Manipulative	Job Sheet: find problem with several motors, find loose connection, find faulty switch
3. Replace fan motor (evaporator, condensor, and inside circulating)	Concept	Information Sheet (illustrate) A/V demonstrate how to replace (physically & electrically) Job Sheet - replace and connect evaporator fan motor and blade condensor fan motor and blade

MAJOR BLOCK REFRIGERATION UNIT NUMBER REF-37

TASK Refrigerators and Freezers

UNIT Troubleshooting Compressor Burnout on Refrigerators & Freezers

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Causes of compressor burn out	Rule Learning	Information Sheet = (with illustrations) list causes A/V - show burnouts and how to check visually by odor, and using meter
2. Test compressor windings	Rule Learning	Information Sheet - procedure to find (C - R - S) of compressor and detect burnout, short, or ground
	Discriminative	Assignment sheet - several problems on finding (CRS) on paper
	Manipulative	Job Sheet - use VOM to find CRS, shorted or open winding
3. Replace compressor	Concept	Information Sheet procedure on replacing compressor (rotary and reciprocating)
	Manipulative	Job Sheet - replace - evacuate charge system
4. Seal the system	Concept	Information Sheet - how to seal the system
	Manipulative	Job Sheet - seal up and check for proper operation

MAJOR BLOCK REFRIGERATION **UNIT NUMBER** REF-38

TASK Refrigeration & Freezers

UNIT Troubleshooting refrigerators and freezers (electrical systems)

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Reading a wiring diagram	Concept/ Manipulative	Information Sheet - after this sheet discusses the information sheet a checkpoint is advised to further discuss and demonstrate Job Sheet - use wiring diagram to check out components
2. Test components for proper operation according to customer complaint symptom	Rule Learning/ Manipulative	Information Sheet - a checklist with testing and diagnosis procedures Job Sheet - instructor may give student several typical complaints to troubleshoot

MAJOR BLOCK

RESIDENTIAL ELECTRICAL WIRING

REW -01 -- REW-13 Secondary

MAJOR BLOCK Residential Wiring **UNIT NUMBER** REW-01

TASK Grounded Outlets (115v-230v)

UNIT Installing 115v appliance outlets

OBJECTIVE(S)

Install a 115v appliance outlet.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Identify types of wall boxes.	Concept	Information Sheet with illustrations or text assignment if available explaining the various types and functions of boxes
2. Determining of wire for applicable appliance.	Discrimination	Information Sheet on various types of appliances and wire sizes required with illustrations of writing on wire
3. Determine size of circuit breaker.	Concept	Information Sheet with illustrations of location ampacity rating
4. Identifying 115v duplex grounded outlet.	Concept	Text Assignment
5. Procedures for installing a 115 v appliance outlet.	Rule-learning	1. Assignment sheet containing questions to be answered 2. Audio-visuals of the complete installation
6. Select material and install a 115v appliance outlet	Manipulation	Job Sheet--instructed to install a 115v appliance outlet

MAJOR BLOCK Residential Wiring **UNIT NUMBER** REW-02

TASK Grounded Outlets (115v-230v)

UNIT Installing convenience outlets

OBJECTIVE(S)

Install a convenience outlet.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Determine the difference between the 115v convenience outlet and the 115v appliance outlet.	Concept	Information Sheet with illustrations of wiring--and comparisons
2. Procedure for installing a 115v convenience outlet	Rule-learning	Code article to refer student to acceptable outlets per circuit. Information Sheet with illustrations detailing wiring
3. Select material and install three 115v convenience outlets.	Manipulation	Job Sheet ins-ructions on installing 115v convenience outlet. Provide breaker box and convenience outlet allowing students to draw in color coded wires before the actual project is assembled.

MAJOR BLOCK Residential Wiring **UNIT NUMBER** REW-03

TASK Grounded Outlets (115v-230v)

UNIT Installing lighting outlet

OBJECTIVE(S)

Design and install simple lighting circuits.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Identify components of simple lighting circuit.	Concept	Information Sheet Illustrations Plastic/metal 4"oct. Depths Brackets Single-pole switch Wire size Feeder Switch leg
2. Designing simple lighting outlet	Problem-solving	Assignment Sheet Illustrations Panel Single-pole switch Lighting switch
3. Procedures to install	Rule-learning	Slide/Tape Install boxes (Reinforce wire size) Pulling wire Connection Wiring box
4. Install	Manipulation	Job Sheet Student compile list of materials Procedures Illustrations (terminal end connections)
5. Multiple lighting outlets (single-pole)	Manipulation	Job Sheet Include information 2 lights--one switch Do this just as the combined efforts of assignment and job done on previous activity.

MAJOR BLOCK Residential Wiring **UNIT NUMBER** REW-04

TASK Grounded Outlets (115v-230v)

UNIT Installing split and switched receptacles

OBJECTIVE(S)

Design and install split and switched receptacles.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Determine the difference between a switched receptacle and a convenience outlet.	Concept	Information Sheet (Jumpers, that little tab, reasons for split receptacle, many times, 1/2 of receptacle will be switched)
2. Design a switched receptacle	Problem-solving	Assignment Sheet Illustration Feeder wire Switch leg Panel Single-pole switch
3. Install switched receptacle both hot	Manipulation	Job Sheet Student compile list of materials, procedures, illustrations (terminal end connections)
4. Install a split switched receptacle	Manipulation	Job Sheet Include information about split receptacle and combine the assignment and job sheet into one page.

MAJOR BLOCK Residential Wiring **UNIT NUMBER** REW-05

TASK Grounded Outlets (115v-230v)

UNIT Installing a door bell circuit

OBJECTIVE(S) Install a door bell circuit for both one button and two-button stations

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Components of door bell system	Concept	Text Assignment
2. Explanation of components	Concept	Information Sheet transformer chime button primary and secondary wiring
3. Design a one button station	Problem-solving	Assignment Sheet (picture of components to draw in wires and identify primary and secondary wiring)
4. Procedures to wire door bell circuit (one button station)	Rule-learning	Slide/tape
5. Install a one button station	Manipulation	Job Sheet
6. Install a two button station	Manipulation	Job-sheet (draw circuits into diagram Be sure to include required informati

MAJOR BLOCK Residential Wiring UNIT NUMBER REW-06

TASK Grounded Outlets (115-230v)

UNIT Installing a three-way switch

OBJECTIVE(S)

Design and install a three-way switch

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Theory and use of three-way switches	Concept	Information Sheet
2. Operation of three-way switches	Concept	Text Assignment
3. Design a simple three-way switch	Problem Solving	Assignment Sheet (give fixtures boxes switches and switch panel. Activity will be to draw in the circuit.)
4. Procedures of installing three-way switch	Rule-learning	Slide/tape (include all the way to breaker box)
5. Install simple 3-way circuit (one light)	Manipulative	Job Sheet(include all the way to breaker panel.)
6. Install 3-way, No. 2	Manipulative	Job Sheet
7. Install 3-way (more than one light)	Manipulative	Job Sheet
8. Install 4-way	Manipulative	Job Sheet

MAJOR BLOCK Residential Wiring **UNIT NUMBER** REW-07

TASK Grounded Outlets (115v-230v)

UNIT Installing 230v circuits and outlets

OBJECTIVE(S)

Install 230v circuits to a junction box, flush mount receptacle and surface mount receptacle

<table>
<tr><th>DETAILING AND SEQUENCING</th><th>LEARNING TYPE</th><th>TYPE OF ACTIVITY</th></tr>
<tr><td>1. Identify types of 230v outlets and applications</td><td>Concept</td><td>Information Sheet
outlets and appliances with and without outlets/include breaker sizes (construct chart fo different requirements (amp), appliance wire size and breaker size</td></tr>
<tr><td>[illegible]. determine circuit characteristics</td><td>Discrimination</td><td>Assignment sheet--
<table>
<tr><th></th><th>Wire size</th><th>breaker s.</th><th>type of outlet</th></tr>
<tr><td>Oven</td><td></td><td></td><td></td></tr>
<tr><td>Dryer</td><td></td><td></td><td></td></tr>
<tr><td>etc.</td><td></td><td></td><td></td></tr>
</table></td></tr>
<tr><td>3. Procedures in installing to junction box</td><td>Rule-Learning</td><td>Slide/tape -- From breaker to combination of surface unit and oven (include circuit without junction connection)</td></tr>
<tr><td>4. Design 230v circuit (open junction box)</td><td>Problem solving</td><td>Assignment Sheet (draw in circuit)</td></tr>
<tr><td>5. Install 230v circuit (open junction box)</td><td>Manipulative</td><td>Job Sheet</td></tr>
<tr><td>6. Procedures to install flush mount receptacle</td><td>Rule-Learning</td><td>slide/tape</td></tr>
<tr><td>7. Install flush mount receptacle</td><td>Manipulative</td><td>job sheet (include drawing in circuits)</td></tr>
<tr><td>8. Install surface mount 230v circuit</td><td>Manipulative</td><td>Job sheet (brief explanation, illustrations of components to have student draw in circuits.)</td></tr>
</table>

MAJOR BLOCK Residential Wiring **UNIT NUMBER** REW-08

TASK Service Entrance

UNIT Installing service entrance

OBJECTIVE(S)

The student will be able to correctly install the exterior portion of a service entrance.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types and uses of weatherheads.	Concept	Text assignment
	Discrimination	Assignment Sheet (Identify illustrations)
	Manipulation	Job Sheet (label weatherheads)
2. Uses of a mast and straps.	Concept	Information Sheet
	Discrimination	Assignment Sheet
3. Types and sizes of meter bases.	Concept	Text Assign. 268-270 Information Sheet (about sizes and ampacity)
	Discrimination	Assignment Sheet (choosing a meter base from an assortment Audio-visual--slides and tapes
	Manipulation	Job Sheet (install a hub and mast on a meter base)
4. Type and sizes of entrance cable and straps above the meter base.	Concept	Test assignment, Information Sheet, and Audio-visuals
	Discrimination	Assignment Sheet (select various sizes of entrance cable according to ampacity)

MAJOR BLOCK	Residential Wiring
UNIT NUMBER	REW-08 (cont'd)
TASK	Service Entrance
UNIT	Installing service entrance
OBJECTIVE(S)	

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
5. Types and sizes of box connectors.	Concept	Information Sheet
	Discrimination	Assignment Sheet (Identify illustrations)
	Manipulation	Job Sheet
6. Procedures to install a service entrance from the meter base up, using a mast.	Concept	Information Sheet
	Discrimination	Assignment Sheet
		Audio-visuals--slides and tapes
	Manipulation	Job Sheet
7. Procedure to install a service entrance from meter base up, using exposed entrance.	Concept	Information Sheet, Audio-visuals
	Discrimination	Assignment Sheet
	Manipulation	Job Sheet

MAJOR BLOCK Residential Wiring **UNIT NUMBER** REW-09

TASK Service Entrance

UNIT Install main panel

OBJECTIVE(S)

Install and wire service entrance cable and main panel.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Information regarding entire service entrance installation.	Concept	Information Sheet
2. Types of main distribution panels.	Concept	Information Sheet (text if available)
3. Types of main distribution panels.	Discrimination	Assignment Sheet (identify criteria of different size and types of panels)
4. Procedures to install main panel	Rule-learning	Slide/tape (Breaker box) (Include wire from meter base to panel, bus bars or guts of panel and wiring in entrance cable) (Inhibitor) (Wire to meter base)
5. Install main panel	Manipulation	Job Sheet (Illustrations and procedure)

MAJOR BLOCK Residential Wiring **UNIT NUMBER** REW-10

TASK Service Entrance

UNIT Temporary Service

OBJECTIVE(S)

Install a temporary service entrance.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Identify component layout of a temporary service	Concept	Information Sheet with illustrations
2. Choose appropriate components for a temporary service entrance	Discrimination	Assignment Sheet--given a situation or problem--student will select components
3. Procedures of assembly	Rule-learning	Slide/tape
4. Assemble components	Manipulative	Job Sheet--completely assemble a complete service

MAJOR BLOCK RESIDENTIAL WIRING **UNIT NUMBER** REW-11

TASK Blueprint Reading

UNIT Using standard measurement

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY

MAJOR BLOCK RESIDENTIAL WIRING **UNIT NUMBER** REW-12

TASK Blueprint Reading

UNIT Identifying residential wiring symbols and Designing circuits

OBJECTIVE(S)

Design wiring circuits for lighting , convenience, and appliance outlets. (115v and 230v)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Circuit loads	Concept	Information Sheet (be sure to refer to code) Include different plan than below with sample circuit layouts.)
2. Lighting and convenience circuits	Problem-solving	Assignment Sheet Plan with components located (w/o wire)
3. 115v appliance outlets	Problem-solving	Assignment sheet Same leyout as above (less wire design)
4. 230v appliance outlets	Problem-solving	Assignment sheet (same as above less wiring design)
5. Symbols	Concept	Information Sheet Assignment Sheet

MAJOR BLOCK RESIDENTIAL WIRING **UNIT NUMBER** REW-13

TASK Blueprint Reading

UNIT Estimating materials

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Reading a scale	Concept	Information sheet (tips in estimating material)

MAJOR BLOCK

MAJOR APPLIANCES

MA-01 -- MA-31 Secondary

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-01

TASK Installation of Appliances

UNIT Installing electric ranges

OBJECTIVE(S)

Run power for and install electric ranges

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
I. Electrical installation of a range		
A. Install 220v receptical	Concept/Discriminative	Text Assignment (Code Book)
1. Size wire to National Electric Code		
2. Pull wire from appliance to panel	Rule learning	Information Sheet - how to run wire, install receptical, and hook up to power panel
3. Install receptical		A/V on installing 220 v receptical
4. Hook up to power panel	Manipulative	Job Sheet - actually install
5. Check for proper grounding if installation of wiring is not required.		
II. Physical installation of a range		
A. Pre delivery set up	Rule learning	Information Sheet - on how to install pig tail, leveling legs
B. Final set up	Rule learning	Information Sheet - plug in, set in place, level, take out packing, packing harnesses and shipping fastners A/V covering all (A & B)

(Continued)

MAJOR BLOCK MAJOR APPLIANCE UNIT NUMBER MA-01 (cont'd)

TASK Installation of Appliances

UNIT Installing electric ranges (Continued)

OBJECTIVE(S)

Run power for and install electric ranges

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
	Manipulative	Job Sheet - have student go through actual process of installing electric range
Checkout	Rule learning	Information sheet on what to check for proper operation
Customer Relations	Concept	Information sheet - explain to customer how to operate appliance clean up and remove carton

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-02

TASK Installation of Appliances

UNIT Installing electric oven

OBJECTIVE(S)

Run power for and install an electric oven

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
I. Install 220v special outlet box		
1. Size wire to National Electric Code	Concept/Discriminative	Text Assignment (Code book)
2. Run wire from appliance to panel		Information Sheet explaining how to run wire, install receptical and hook up to power panel
3. Install special outlet box		Illustrations may cover this adequately since A/V was shown on range package
	Manipulative	Job Sheet
II. Physical Installation of Oven		
1. Slide cover into cabinet	Rule learning	Information sheet explaining how to install
2. Remove paper		A/V covering installation
3. Check operation	Manipulative	Job Sheet - instructing student to actually install an oven
4. Bolt down		
III. Customer Relations	Concept	Information Sheet - make sure warranty cards are there and show how to use appliance.

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-03

TASK Installation of Appliances

UNIT Installing surface unit and hood

OBJECTIVE(S)

Run wires for and install a surface unit and exhaust hood (vented and ventless)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
I. Install 220v special outlet box	Concept/Discriminative	Text Assignment (Codebook) 1. Size wire Info sheet covering 2. Run wire from appliance to panel 3. Install special outlet box 4. Hook up to power panel
	Rule learning	Info sheet may include illustrations since A/V on this topic was shown with range package
	Manipulative	Job sheet - have student perform task
II. 1. Place into counter top	Concept/Rule learning	Info sheet on how to actually install surface unit
2. Remove shipping restraints		
3. Check operation	Rule learning	A/V showing steps
4. Bolt down	Manipulative	Job Sheet - have student install unit
III. Install 110v special outlet box		
1. Size wire	Rule learning	Info sheet with illustrations
2. Run wire		
3. Install special outlet box	Manipulative	Job sheet

(Continued)

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-03 (cont'd)

TASK Installation of Appliances

UNIT Installing surface unit and hood (Continued)

OBJECTIVE(S)

Run wires for and install a surface unit and exhaust hood (vented and ventless)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
4. Hook up to power panel		
IV. Installing exterior vented hood		
1. Hook up wires	Rule learning	Info sheet
2. Bolt onto wall or cabinet		w/illustrations on how to install vented hood
3. Run duct work and vent	Rule learning	A/V on both types of hoods, it should point out that with the exception of duct work both types are the same.
4. Check out		
5. Customer relations explaining how to operate, clean or change filters and warranty information	Manipulative	Job sheet on interior vent hood Job sheet on installing exterior vented hood
Customer relations	Concept	Clean up, explain operation, check warranty cards, etc...
V. Physical Installation of interior exhaust (ventless)		
1. Hook up wires		
2. Bolt onto wall or cabinet	Rule learning	Info sheet w/illustrations on how to physically install ventless hood
3. Check out		
4. Customer relations		

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-04

TASK Installation of Appliances

UNIT Installing automatic electric dryers

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
I. Electrical installation	Discriminative/ Concept	Text Assignment (Codebook) 1. Size wire Info Sheet 2. Run wire 3. Install receptical 4. Hook up to power panel 5. If wiring not required check for grounding
II. Physical installation of a range		
A. Pre delivery set up	Concept	Info sheet on pigtail and leveling legs w/illustrations
B. Physical delivery		
C. Final set up	Rule learning	Info sheet - plug in and place and how to level, how to lock down, secure level legs
D. Check out		Remove packing restraints
E. Customer relations		Job sheet - install dryer Info sheet - on clean up, explaining operation, and warranty
III. Install Dryer Vent		Info sheet - different ways of cutting holes in sabre saw hole saw and key hole saw. A/V explaining how Job Sheet - have student install vent in particle board

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-05
TASK Installation of Appliances
UNIT Installing washing machine
OBJECTIVE(S)

Run power for and install a washing machine

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
I. Electrical installation		
Install a single purpose 110v outlet		
1. Size wire	Discriminative/Concept	Text Assignment (Codebook)
2. Run wire	Concept	Info sheet
3. Install receptional		
4. Hook up to power panel		
5. Check for grounding if wiring is available		
II. Physical Installation		
A. Pre delivery set up	Rule learning	Information Sheet - Uncrate install leveling legs or installation instructions
B. Final set up	Rule learning	Info sheet - remove installation instructions and parts from tub - install hoses (water inlet and outlet) Remove shipping restraints check out, set (rear adjusting) leveling legs if applicable. Hook up hoses to drain and water outlet (hot & cold).
Make sure washing machine is properly grounded		
Customer relations		A/V & Job Sheet

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-06

TASK Installation of Appliances

UNIT Installing dishwasher

OBJECTIVE(S) Install an automatic dishwasher

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Anchoring the machine	concept	Information Sheet
Electrical connections	concept	Information Sheet
Water connections	concept	Information Sheet
Installation Procedures	R/L	Job Sheet

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-07

TASK Installation of Appliances

UNIT Installing a garbage disposal

OBJECTIVE(S) Install an automatic garbage disposal

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Water connections	Concept	Information Sheet
Electrical connections	Concept	Information Sheet
Installation Procedures	R/L	Job Sheet

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-08

TASK Installation of Appliances

UNIT Installing refrigerator and freezer

OBJECTIVE(S)

Run power for and install a refrigerator and a freezer

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
I. Electrical installation		
Install a single purpose 110v outlet		
1. Size wire	Discriminative/Concept	Text Assignment (Codebook)
2. Run wire	Concept	Info sheet
3. Install receptical		
4. Hook up to power panel		
5. Check for grounding if wiring is available		
II. Physical Installation of a chest freezer	Concept	Info sheet w/illustrations
A. Pre deliver	Rule learning	Uncrate - check for dents, blemish
B. Physical deliver		Doors may be removed if needed - installation instructions cover this.
C. Final set up		May need to level with wedges - most don't have leveling feet
	Rule learning	A/V on how to install
	Manipulative	Job sheet - instruct student on installing chest freezer

(Continued)

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-08 (cont'd)

TASK Installation of Appliances

UNIT Installing refrigerator and freezer (Continued)

OBJECTIVE(S)

Run power for and install a refrigerator and a freezer

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
III. Physical Installation of upright freezer	Concept	Info sheet w/illustrations
A. Pre deliver	Rule learning	Uncrate - check for dents, blemish
B. Physical deliver		Doors may be removed if needed-installation instructions cover this.
C. Final set up		Must add leveling legs and level - level by door swing method
	Rule learning	A/V on how to install upright freezer w/illustrations
	Manipulative	Job sheet - install freezer
IV. Refrigerator		
A. Pre deliver		Info sheet - level casters, show with illustrations how to use caution when rolling refrigerator on casters (customer relations) - it can cut floor, plug in and remove shipping restraints
B. Physical deliver		
C. Final set up		
		Job sheet - install
		(Continued)

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-08 (cont'd)

TASK Installation of Appliances

UNIT Installing refrigerator and freezer (Continued)

OBJECTIVE(S)

Run power for and install a refrigerator and a freezer

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
V. Installing Ice Maker	Rule learning	Info sheet - identify water (cold) source, install saddle valve a. self tapping for copper b. non self tapping for other types Run copper line leaving coil of tubi behind refrigerator. Place ferrule and nuts on, water check for leaks
	Manipulative	Job sheet - install using above procedures
VI. Customer relations	Concept	Explain how to use appliances, care for them and warranty information.

MAJOR BLOCK MAJOR APPLIANCE	**UNIT NUMBER** MA-09

TASK Installation of Appliances

UNIT Transporting Major Appliances

OBJECTIVE(S)

Transport major appliances with handtrucks and delivery truck

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Use hand truck	Rule learning	Info sheet & A/V correct use of the hand truck
	Manipulative	Job sheet using the hand truck . putting on . taking off . negotiating stairs . how to work with two people
2. Transporting on a truck	Concept	Info sheet - check directions to delivery
	Manipulative	Job sheet - tie down, secure and correct placement (refrigerator door)
3. Unloading	Concept	How lift gate works safety factors
4. General transporting - loading and unloading and placement tips	Concept	Info sheet with illustrations

MAJOR BLOCK Major Appliances **UNIT NUMBER** MA- 10

TASK Troubleshooting Washing Machine

UNIT Total washing machine operation

OBJECTIVE(S) Demonstrate a knowledge of the total washing machine operation

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Total washing machine operation	Concept	Information Sheet - give a brief description of how the machine works
2. Parts identification	Concept	A/V - covering all the different parts comparing the same parts from different machines Job Sheet - give student miscellaneous parts to label
3. Remove and replace parts	Rule Learning	A/V - with procedures of how to remove (and replace if necessary) parts. Job Sheet - have student completely break down machine

MAJOR BLOCK Major Appliance **UNIT NUMBER** MA-11

TASK Troubleshooting washing machine

UNIT Electrical systems operation and troubleshooting

OBJECTIVE(S)

Troubleshoot the electrical systems operation of a washing machine operation

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. System operation	Concept	Information Sheet - including esterline chart and schematic diagram. Also basic electrical operation.
2. Component operation	Concept	Information sheet - brief description of components including but not limited to: timer, water level switch, knock out switch, drive motor and solenoids. A/V - removal and if necessary replacemen of electrical parts Job Sheet - student will remove and label electrical parts
3. Electrical system troubleshooting procedure	Rule learning	A/V - on what and how to check Information sheet - of what to check and in what order Job Sheet - have student troubleshoot several problems

MAJOR BLOCK Major Appliance **UNIT NUMBER** MA-12

TASK Troubleshooting Washing Machine

UNIT Testing and installing capacitors

OBJECTIVE(S) Test and install capacitors in washing machines

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Purpose and types of capacitors in washers	Concept	Text assignment Assignment sheet - student must identify capacitors and electrical characteristics
2. Capacitor rules	Rule Learning/ Manipulative	Information sheet Job sheet - using rules
3. Procedure for checking capacitors	Rule Learning/ Job Sheet	A/V giving location of capacitors in the washer and how to check them Information sheet - w/illustrations of capacitors in relation to washer and procedures for checking Job sheet - checking capacitors for leaks, opens and shorts (10 start and 10 run capacitors)
4. Determine rating of capacitor	Manipulative	Job sheet - determine rating of capacitor if information is elligible

MAJOR BLOCK Major Appliance UNIT NUMBER MA- 13

TASK Troubleshooting washing machine

UNIT Mechanical systems operation and troubleshooting

OBJECTIVE(S) Troubleshoot the mechanical system operation in a washing machine operation

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. System operation	Concept	Information sheet - on how the mechanical system works - an A/V may be submitted here)
2. Component operation	Concept	Information sheet - covering transmission (gear case), damper system, suspension, super structure Job sheet - have student dismantle and label or identify the parts of the mechanical system
3. Troubleshooting procedure	Rule learning	A/V - on what and how to check out Information sheet - information sheet will cover trouble shooting procedure with illustrations as applicable Job sheet - give student 2 or 3 different kinds of problems

MAJOR BLOCK Major Appliance **UNIT NUMBER** MA- 14

TASK Troubleshooting Washing Machines

UNIT Checking and replacing belts

OBJECTIVE(S) Check and replace belts on a washing machine

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Procedures to service and replace belts	Rule Learning	A/V on how to examine, remove, replace and adjust the belts on a washer
2. Remove, replace and adjust washer belts	Manipulative/ Rule Learning	Job sheet - include detailed procedures as well as diagrams and illustrations

MAJOR BLOCK Major Appliance **UNIT NUMBER** MA -15

TASK Troubleshooting Washing Machines

UNIT Water systems operation and troubleshooting

OBJECTIVE(S) Troubleshooting the water system in a washing machine

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. System operation	Concept	Information sheet - how system works (in addition or in lein of this information sheet and A/V may be used)
2. Component operation	Concept	Information sheet - this sheet will cover dispensers, and filtering systems, mixing valve, and pump (if necessary an A/V may be used to cover the mixing valve) Job Sheet - dismantle the entire water system and identify the parts
3. Water system troubleshooting procedure		A/V on what and how to check Information sheet - general troubleshooting procedures Job sheet - have student troubleshoot 2 or 3 problems

MAJOR BLOCK MAJOR APPLIANCES **UNIT NUMBER** MA-16

TASK Troubleshooting Electric Dryer

UNIT Troubleshooting the dryer's mechanical and air system

OBJECTIVE(S) Troubleshoot the dryer's mechanical and air system

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Identify types of dryer drives	Concept	Text Assignment (suggested text: Servicing Major Appliances, Vol. II pp. 259-261).
	Discriminative	Assignment Sheet
Procedure to remove and service idler pulley	Rule Learning	Information Sheet - As a reference to use in wirting this sheet use a service manual
Procedure to remove and replace belt	Rule Learning	Assignment - use service manual to help write it
	Rule Learning	A/V covering procedures to remove and service ~~both~~ idler pully and replace belt
Remove and replace idler pully	Manipulative	Job Sheet w/illustrations and procedures may need to refer to service manual
Remove and replace belt	Manipulative	Job Sheet w/illustrations and procedures may need to refer to service manual

MAJOR BLOCK MAJOR APPLIANCES **UNIT NUMBER** MA-16 (cont'd)

TASK Troubleshooting Electric Dryers

UNIT Troubleshooting the dryer's mechanical and air system

OBJECTIVE(S) Troubleshoot the dryer's mechanical and air system

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Identify types of blower assembly and drum bearings	Concept Discriminative	Text Assignment - suggested text: Servicing Electrical Appliances Vol. II, pp. 259-261
Procedures to check and repair blower assembly and drum bearings	Rule Learning	Text Assignment - suggested text: Servicing Electrical Appliances Vol. II, pp. 269-271 and service manual Assignment Sheet A/V covering blower assembly types and procedures to check and repair blower assembly and drum bearings
Check and repair blower assembly and drum bearings	Manipulative	Job Sheet - procedures with illustrations on how to check and repair blower assembly and drum bearings

MAJOR BLOCK MAJOR APPLIANCES **UNIT NUMBER** MA-17

TASK Troubleshooting Electric Dryers

UNIT Troubleshoot a dryer electrical system

OBJECTIVE(S) Troubleshoot a dryer electrical system

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Identify types and wattages of heat elements	Concept Discriminative	Text Assignment - suggested text: Servicing Electrical Appliances, Vol. II, pp. 258
Procedures to test heating element in dryer	Rule Learning	Text Assignment - suggested text: Servicing Electrical Appliances, Vol. II, pp. 264
Test heating element	Manipulative	Job Sheet - service manual for particular dryer should give illustrations and procedures for testing
Procedures to replace heat element	Rule learning	Information sheet - general information gathered from service manual A/V - cover types, testing and replacing heating elements
Replace heating element	Manipulative	Job Sheet include use of service manual

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-17 (cont'd)

TASK Troubleshooting Electric Dryers

UNIT Troubleshoot a dryer electrical system

OBJECTIVE(S) Troubleshoot a dryer electrical system

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Identify parts of electrical system	Concept Discriminative	Information Sheet and service manual include heating elements, thermostat, door switch, centrifugal switch, wiring and timer motor
Procedures to check components	Rule Learning	Text
1. heating element		1. pp. 264
2. thermostat		2. 264
3. door switch		3. 264-265
4. centrifugal switch		4. 265
5. motor		5. 266
6. wiring		6. 266
7. timer		7. 266
Check components on a dryer	Manipulative	A/V showing identification and procedures for checking components Job Sheet - have the student use his service manual and check each part
	Check	Suggested activity: have some bugged parts for student to repair

MAJOR BLOCK MAJOR APPLIANCES **UNIT NUMBER** MA-17 (cont'd)

TASK Troubleshooting Electric Dryers

UNIT - Troubleshoot a dryer electrical system

OBJECTIVE(S) Troubleshoot a dryer electrical system

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Identify types of dryer motors and mounts	Concept Discriminative	Information Sheet
2. Procedures to remove dryer motor	Rule Learning	Information sheet and/or service manual
3. Replace a dryer motor	Manipulative	Job Sheet - illustrations and procedures for replacing

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-18

TASK Troubleshooting Automatic Dishwasher

UNIT Testing and replacing solenoids

OBJECTIVE(S)

Test and replace solenoid on an automatic dishwasher

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Principles of solenoid (How it works)	Concept	Information sheet - with illustrations of solenoids operating soap dispenser, fill valve (water dispenser). Assignment sheet - on principles Questions and instructor check
2. Function of solenoid (Opening and closing circuit, job that solenoid performs)	Concept	Information sheet - with illustrations of the various functions performed Assignment sheet - on functions Questions and instructor check
3. Testing, Removing, and replacing solenoid	Rule learning	Information sheet - w/illustrations showing how to test A/V on principles and functions covered above, also show how to test 1. connecting into a circuit 2. check for continuity Job sheet - have student connect solenoid to circuit and also check with meter

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-19

TASK Troubleshooting Automatic Dishwashers

UNIT Checking water level control and testing and replacing safety door swi

OBJECTIVE(S)

Check and replace safety door switch

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Function of the safety door switch	Concept	Information sheet - with illustrations t point out function as a main control switch and point out location
		Assignment sheet - questions over functions
Testing and replacing safety door switch	Rule learning	Information sheet - with illustrations check for continuity and make a visual inspection
	Manipulative	Job sheet - student will operate machine and observe how switch works and what it does. Also student will test for continuity.
Function of the water level control switch	Concept	Information sheet - illustrated, point out functions, controlling solenoid that opens and closes water valve
		Job sheet - student will test continuity and visually inspect and replace

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-20

TASK Troubleshooting Automatic Dishwashers

UNIT Checking and replacing heating element on dishwashers

OBJECTIVE(S)

Test and replace heating elements on an automatic dishwasher

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Function of Heating element	Concept	Information sheet - illustrations, how it works and what it is suppose to do Assignment sheet - questions over functions
Testing, removing and replacing	Rule learning	Information sheet - how to test for continuity, context with thermometer A/V - how to test and remove and replace Job sheet - test for resistance, remove and replace

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-21

TASK Troubleshooting Automatic Dishwashers

UNIT Testing and replacing motor relays

OBJECTIVE(S)

Check and replace motor relays

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Function, location and identification of the motor relay	Concept	Information sheet - illustrated explaining it's principle job or purpose - controlling
		Assignment sheet - questions on location and function
2. Test and replace relay switch	Rule learning	Information sheet - illustrated, how t test for continuity and also hook up to a circuit 1. test on a board 2. test on an actual unit
	Rule learning	A/V on how to test and replace and where its located
	Manipulative	Job sheet - test, replace motor relays as described in information sheet

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-22

TASK Troubleshooting Automatic Dishwasher

UNIT Replacing automatic dispensers

OBJECTIVE(S) Replace and check automatic dispenser on dishwasher

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Location - function of automatic soap dispenser	Concept	Information sheet - w/illustration explaining how it works: activated by solenoid which is activated by cam and timer motor
		Assignment sheet - questions
sting, removing soap dispenser assembly	Rule learning	Information sheet - on how to test, isolate leads from timer to hook to new switch and also get a separate power source to test solenoid or replace unit
	Rule learning	A/V of a trainer w/glass door, show location of dispenser assembly
	Manipulative	Job sheet - test, remove and replace as described in information sheet and A/V

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-23

TASK Troubleshooting automatic dishwashers

UNIT Testing and replacing drain pumps

OBJECTIVE(S)

Check and replace drain pump on automatic dishwasher

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Identify and locate drain pump and discharge hose	Concept	Information sheet - with illustrations, point out in sheet that some have a separate motor for pump and spray drive others have one motor for both pump and drive.
Remove, test and replace pump	Rule learning	Information sheet - on how to check for continuity and how to remove and replace how to hook up isolated to test it, visually inspect hose
	Manipulative	A/V showing all parts and different units with different types of pumps
		Job sheet - have student test, replace, remove and visually inspect

MAJOR BLOCK MAJOR APPLIANCE UNIT NUMBER MA-24

TASK Troubleshooting Automatic Dishwashers

UNIT Testing and installing timer

OBJECTIVE(S)

Test and replace timer on automatic dishwasher

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Operation of timer	Concept	Information sheet - showing cycle chart, pictoral diagram and schematic
Test timer		Information sheet - describing how to test the timer
		Assignment sheet - on operations and testing of timers
Remove and replace timer	Rule learning	A/V covering operation as well as testing procedures
	Manipulative	Job sheet - how to remove and replace timers

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-25

TASK Troubleshooting Automatic Dishwashers

UNIT Diagnosing and repairing automatic dishwashers

OBJECTIVE(S)

Diagnose and repair an automatic dishwasher

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-26

TASK Troubleshooting electric ranges

UNIT Testing and replacing surface unit elements

OBJECTIVE(S)

Test and replace surface unit elements

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Identify types and sizes of elements	Concept/ Discriminative	Information sheet - include 6" and 8" eyes also 3 wire units used with step switches and two wire units used with infinite switches. Include basic construction information.
Test surface units cold with V.O.M.	Concept/Manipulative/ Rule learning	Job sheet with procedures of checking 3 wire and 2 wire units with VOM.
Procedures to remove check and install	Rule learning	A/V Include contacts and brackets for plug in units
Remove, check and install	Manipulative	Job sheet

MAJOR BLOCK MAJOR APPLIANCE UNIT NUMBER MA-27

TASK Troubleshooting electric ranges

UNIT Testing and replacing surface unit switches

OBJECTIVE(S)

Test and replace surface unit switches

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Identify different types of surface unit switches. Infinite and step	Concept/ Discriminative	Servicing electrical appliances Vol 1 - pp. 252 - 254. Text for step and pp. 255, 256 Infinite suggested text
Test step switches cold	Concept	Job sheet with procedures
Test infinite switches with load	Manipulative/ Rule learning	Procedures
Procedures to remove check to install	Rule learning	A/V include how to do job if no schematic is available
Test and replace	Manipulative	Job sheet - do with switches in range both types

MAJOR BLOCK MAJOR APPLIANCE **UNIT NUMBER** MA-28

TASK Troubleshooting electric ranges

UNIT Testing and replacing oven elements

OBJECTIVE(S)

Test and replace bake and broil elements in an oven

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Identify types and sizes of bake and broil elements	Concept/ Discriminative	Information sheet include various shapes and types of electrical connections
Test oven units cold with V.O.M.	Concept/ Manipulative/ Rule learning	Job sheet with procedures of test
Procedures to remove check and install bake and broil units	Rule learning	A/V covering removal, check-out and installation of bake and broil units
Remove check and install oven units	Manipulative	Job Sheet

MAJOR BLOCK MAJOR APPLIANCES **UNIT NUMBER** MA-29

TASK Troubleshooting electric ranges

UNIT Testing and replacing oven temperature controls

OBJECTIVE(S)

Test and replace oven temperature controls

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Identify types of thermostats and selector switches	Concept/ Discriminative	Home Appliance Servicing pp. 262-268
Testing oven temperature controls in oven and removal if needed	Rule learning	A/V - include procedures to test and remove
Test oven temperature controls in oven	Manipulative	Job sheet
Remove oven temperature controls and replace	Manipulative	Job sheet

MAJOR BLOCK MAJOR APPLIANCES **UNIT NUMBER** MA-30

TASK Troubleshooting Electric Ranges

UNIT Replacing automatic timer

OBJECTIVE(S)

Replace automatic timer

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Identify timer	Concept	Text - McGraw-Hill Servicing Electrical Appliances, Vol. 1, pp. 297-299
Procedures to check and install	Concept/ Rule learning	Text
Check and install	Manipulative	Job sheet - reinforce procedures in book

MAJOR BLOCK MAJOR APPLIANCE UNIT NUMBER MA-31

TASK Troubleshooting electric ranges

UNIT Service continuous clean and self clean ovens

OBJECTIVE(S)

Servicing continuous clean and self clean oven

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Identify continuous clean oven	Concept/ Discriminative	Information sheet - point out no difference other than oven porcelain, mention repair kit. (A/V) A
Identify self clean oven	Concept/ Discriminative	Text - Servicing Electrical Appliances. pp. 270-271
Procedures for servicing self clean oven	Rule learning	AV - available from Whirlpool
Service self clean oven	Manipulative	Job sheet

MAJOR BLOCK

AIR CONDITIONING

AC-06 -- AC-12 Secondary

REF-26 -- REF-32

AC-01 -- AC-32 Post Secondary

MAJOR BLOCK AIR CONDITIONING **UNIT NUMBER** AC-01

TASK Air Conditioning Fundamentals

UNIT Demonstrate a knowledge of Air Conditioning Systems

OBJECTIVE(S)

Identify basic processes and types of air conditioning systems

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Introduction to A/C	Concept	Text Assignment p. 315-317
2. A/C processes and types of A/C units	Concept	Slide/tape 1. process of A/C 2. types of A/C detailed explanation
3. Identify A/C unit types	Discriminative	Assignment Sheet 10 types
4. Comfort control	Concept	Information sheet - description of A/C Human comfort control, comfort zone (range) air movement medical

Different types of systems such as the mechanical compression cycle or absorption cycle (gas flame) or package or split system primarily talking about design of equipment and fitting the design to the application.

MAJOR BLOCK AIR CONDITIONING **UNIT NUMBER** AC-02

TASK Air Conditioning Fundamentasl

UNIT Applying basic air principles

OBJECTIVE(S)

Determine air properties through the use of graphs and psychrometers.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Benefits of air	Concept	Text Assignment - explanation of how air affects body comfort
2. Principles of psychometics	Concept	Information sheet - (wet bulb, dry bulb, relative humidity)
3. Read psycho charts	Concept	Information sheet - give illustrations identify different scales and their readings (wet bulb, dry bulb, relative humidity)
4. Locating properties on scale	Discriminative	Assignment sheet - from a simple chart student will read the three properties
5. Solve problems from chart	Manipulative	Job sheet - solve problems for each of three properties (given chart and reading for two properties - read third property).
6. Procedure in using sling psychrometer	Rule learning	Slide/tape - first few slides show different types of psychometer
7. Use psychrometer and determine reading from chart	Manipulative	Job sheet - procedures and determine reading on chart

MAJOR BLOCK AIR CONDITIONING **UNIT NUMBER** AC-03

TASK Air Conditioning Fundamentals

UNIT Calculating heat loads

OBJECTIVE(S)

Calculate heat loss and heat gain

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Load calculations (Winter & Summer)	Concept	Text Assignment (Prentice Hall - 380)
2. Load calculation	Rule learning	Slide/tape (Make sure to include J manual procedure)
3. Applying principles of load calculation	Discriminative	Assignment sheet - illustrations depicting measurement points, measurement factors and factors effecting heat loss.
4. Heat loss calculation procedure	Concept	Text Assignment P-H 388-392
5. Calculate heat loss	Manipulative	Job sheet (J-Manual used extensively include form J-1 to be filled by student. Give house layout with dimensions.
6. Heat gain calculation		Text Assignment P-H 400-402
7. Calculate heat gain		Job sheet - same as approach to heat loss

MAJOR BLOCK AIR CONDITIONING UNIT NUMBER AC-04

TASK Air Conditioning Fundamentals

UNIT Applying Principles of Air Movement

OBJECTIVE(S)

Apply principles of air movement through ductwork and air distribution inside the room.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Basic principles of air movement with duct system	Concept	Text Assignment
2. Types of air flow measuring instruments	Concept	Information Sheet (illustration) Types and uses 1. Manometer 2. Anemometer
3. Using air flow measuring instrument	Manipulative	Job Sheet - Have students use each of the above devices to measure velocity of air movement on shop equipment (measure at least 4 or 5 different outlets).
4. Distribution of air	Concept	Text Assignment P-H 647-50

MAJOR BLOCK AIR CONDITIONING **UNIT NUMBER** AC-05

TASK Air Conditioning Fundamentals

UNIT Identifying air filtering systems

OBJECTIVE(S)

Identify and install the various types of air filters

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types of air filtering systems	Concept	Text Assignment PH 546-550 Mechanical & disposal & electronic
2. Components disassembly of electronic air filter	Concept	Slide/tape disassemble and reassemble electronics air filter
3. Disassemble air filter and reassemble install on unit	Manipulative	Job sheet - include procedures and illustration. Install on unit
4. Operate and troubleshoot electronic air filter system		Job sheet - (List procedures) Direct students to equipment manual but include general steps to operation and troubleshooting

MAJOR BLOCK Air Conditioning UNIT NUMBER AC-06
TASK Window Air Conditioning
UNIT Installation of a Window Unit
OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Identifying location and purpose of components	Concept	Assignment Sheet A-V (Match picture components with na
2. Installation of a window A/C	Concept	Information Sheet A/V
	Manipulative	Job Sheet
3. Demonstrating the window unit and informing of preventive maintenance	Concept	Information Sheet A/V which will include explain how to clean coils and filter, watch shrubs make sure they are not restricting air flow to condenser smae with drape and furniture with evaporator on inside. Also make sure they use proper fuse

MAJOR BLOCK Air Conditioning UNIT NUMBER AC-07

TASK Window Air Conditioners

UNIT Performing Pre-season start up for window A/C

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Pre season start up	Concept	Information Sheet (why, when, customer relations, equipment care).
2. Procedure for pre-season start up	Rule learning	Slide presentation (visual inspection, removal of unit clean coils and fan, tube clean or replace filter, re-install seal window and unit, check bracing, straighten fins, start up and check charge (check proper operation)
Procedure	Discriminative	Assignment sheet
3. Perform pre-season start up	Manipulative	Job sheet (procedures, illustration)

MAJOR BLOCK Air Conditioning UNIT NUMBER AC-08

TASK Window A/C

UNIT Troubleshooting compressor burn out in a window A/C

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Causes of compressor burn out	Rule learning	Information sheet w/illustrations, faulty wiring (in correct, under size) improperly fused, voltage lightning, overload, faulty and improperly wired capacitors, faulty over loads, mechanical failute, overload
2. Testing compressor windings	Rule learning	Information sheet (Procedure)
	Manipulative	Job Sheet
	Discriminative	Slide set - visual, using test meters, continuity check with VOM use apm meter on high amps, (safety note - acid)
	Concept	Information Sheet
3. Replace compressor	Manipulative	Job Sheet - remove old compressor flush condenser out with type of reg. that is in system, install new compressor, install liquid line dryer - section line dryer, evacuate leak check, replace capacitors if need and related electrics, charge, check for proper operation
4. Seal Unit	Concept	Information sheet
	Manipulative	Job Sneet

MAJOR BLOCK Air Conditioning UNIT NUMBER AC-09

TASK Window Air Conditioners

UNIT Evacuating & Charging a Window A/C Unit

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. When/why to evacuate/ charge a system	Concept	Information Sheet w/illustrations of difference in humidities.
2. Discriminate between high side/low side	Discriminative	Assignment Sheet (to illustrate difference between suction, discharge)
3. Evacuate and charge the unit	Manipulative	Job Sheet Information sheet including: install access valve, install manifold gauges, hood up vacuum pump, evacuate system (check for leaks using vacuum method), charge the unit (using frost line or other charging method), seal the system, check system for proper operation

MAJOR BLOCK Air Conditioning UNIT NUMBER AC-10
TASK Window Air Conditioning
UNIT Troubleshooting fans and fan motor
OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Determining type of motor	Discriminative	Information sheet (show wiring diagrams and determine which)
2. Check for mechanical failure	Concept	Information sheet A/V (Check bearings, check blade for restrictions)
	Manipulative	Job Sheet
3. Check for electrical failure	Concept	Information sheet, A/V (check for faulty wire--visual check using meter, check switch for v., continuity, sound, check test cord, visual meter check of capacitor, check polarity of capacitor
		A/V for 2 & 3
4. Replace motor concept	Concept	Information sheet, A/V Put note in T.G. that experience has shown replacement is not economical in shop practice on the same unit.

MAJOR BLOCK Air Conditioning **UNIT NUMBER** AC-11

TASK Window Air Conditioning

UNIT Troubleshooting Window Air Conditioners (refrigeration cycle)

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Check for proper operation	Manipulative/ Concept	Information sheet, observation dry bulb, wet bulb, temperature drop, visual to check for sweat, oil. Job sheet (check off sheet)
2. Gain access to refrigeration system of the unit	Manipulative	Information sheet on gain access and check for proper chg. check for non-condensable gases, restrictions and mech failre of compressor, also includes pressure differential and vacuum check, proper refrigerant if entered before, after each symptom is discussed then the procedure for repair will be given - if repair procedures are not given in another portion then they will be given here A/V Job sheet will contain checklist of activities

MAJOR BLOCK Air Conditioning **UNIT NUMBER** AC-12

TASK Window Air Conditioning

UNIT Troubleshooting window A/C electric system

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Wiring diagram	Concept	Information sheet (familiarization and apply knowledge)
	Manipulative	Job Sheet - using wiring diagram to check out system
2. Switch	Concept	Information sheet - rotary and push button, how check continuity understand mechanical operation
		A/V on above
		Job sheet - check different types of switches for continuity
3. Thermostat	Concept	Information sheet, how it works and how to check it
		Job sheet - actually checking out with meter
4. Capacitor	Concept	Information sheet w/illustration and how it works
	Manipulative	Job sheet - check out with meters
5. General troubleshooting procedures	Concept	Information sheet
	Problem Solving	Job sheet - check out A/C - give student symptom (customer complaint) student will apply previous knowledge and skills

MAJOR BLOCK Air Conditioning UNIT NUMBER AC-12 (cont'd)
TASK Window Air Conditioning
UNIT Troubleshooting window A/C electric system
OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
		fan runs on some speeds; but does not on others - compressor runs check switch check fan motor leads compressor does not cycle and ice builds up check thermostat check coils check BTU size compressor cycles on overload check run capacitor check overload check amps check dirty coils

MAJOR BLOCK Air Conditioning **UNIT NUMBER** AC-12 (cont'd)

TASK Window Air Conditioning

UNIT Troubleshooting window A/C electric system

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
		completely in operative check power source check rotar switch or push button switch compressor only runs check switch check capacitor check fan motor fan-motor only runs check switch check capacitor check compressor compressor runs & fan motor runs only on high check fan motor check switch compressor runs, fan doesn't check fan motor fan run capacitor switches and all connections fan runs on all speeds compressor doesn't check compressor windings connections thermostat switch (no compressor hum) fan runs all speeds compressor doesn't but hums check capacitor check leads check compressor terminals check switch

MAJOR BLOCK AIR CONDITIONING **UNIT NUMBER** AC-13

TASK System and Installation

UNIT Installing condensate drain

OBJECTIVE(S)

Identify and install condensate drain

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Purpose and types of condensate drain	Concept	Information sheet - pump out system, natural drain. Include illustrations and uses of each type. Explain trap and connection to drain
2. Determine use of both types	Discriminative	Assignment Sheet - apply types to conditions
3. Installation procedures	Rule learning	Slide/tape - installation and effects of both types. Include slides showing concepts involved in drainage system.
4. Install natural drain condensate	Manipulative	Job Sheet - include some type illustration and procedures.
5. Install pump drain system	Manipulative	Job sheet - include illustrations and procedures

MAJOR BLOCK AIR CONDITIONING **UNIT NUMBER** AC-14

TASK System and Installation

UNIT Installing package unit (residential and mobile home)

OBJECTIVE(S)

Install package cooling unit for residential or mobile home.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Package cooling	Concept	Text Assignment PH 552- 556
2. Duct application	Discriminative	Assignment sheet Use in mobile, in residential system Have students apply concepts of this system to residential types and mobile homes. Use illustration.
3. Installing package cooling unit	Rule learning	Slide/tape Wiring and installing package cooling unit
4. Install package cooling unit	Manipulative	Job sheet - install unit and wire

MAJOR BLOCK AIR CONDITIONING **UNIT NUMBER** AC-15

TASK System and Installation

UNIT Installing split system

OBJECTIVE(S)

Install and wire a split system cooling unit

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Split system cooling	Concept	Information sheet
2. Uses and types of	Concept	Information sheet - illustrations and explanation of different types and uses
3. Application of types per conditions	Discriminative	Assignment sheet - make the student differentiate between types and conditions
4. Installation of split system	Rule learning	Slide/tape (Only air handling capability)
5. Install evaporating and air handling unit	Manipulative	Job Sheet Evaporating, air handling, and condensate drain
6. Install condensing unit	Manipulative	Job sheet
7. Installing refrigeraiton lines	Manipulative	Job sheet - leak check and proper evacuation
8. Wire the condensing unit and evaporator	Manipulative	Job sheet
9. Charging the system	Manipulative	Job sheet charge and test

MAJOR BLOCK AIR CONDITIONING **UNIT NUMBER** AC-16

TASK System and Installation

UNIT Installing add-on split system

OBJECTIVE(S)

Install and wire an add on split system

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Add on split system	Concept	Text Assignment 560-563
2. Installing add on split system	Rule learning	Slide/tape Adding on to an existing heat system
3. Select location for placing condensing unit	Discriminative	Assignment sheet - illustration of residence with existing heating unit Allow student to select proper locatio of condensing unit
4. Installing evaporator coil and condensate	Manipulative	Job sheet
5. Installing condensing unit	Manipulative	Job sheet
6. Installing refrigeration lines and leak check	Manipulative	Job sheet Install lines leak check, evacuate
7. Wire the unit	Manipulative	Job sheet - wire to specifications
8. Charging the system	Manipulative	Job sheet - charge and test

MAJOR BLOCK AIR CONDITIONING **UNIT NUMBER** AC-17

TASK Troubleshooting and Servicing

UNIT Troubleshooting compressor burn out

OBJECTIVE(S)

Troubleshoot and changing a compressor burn out

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Compressor burn out	Concept	Information sheet
2. Procedure for determining compressor or burnout	Concept	Text Assignment P.H. 750-751
3. Clean up procedures	Rule learning	Information sheet (can be based on Sporlan's information booklets)
4. Procedures for changing compressor burn out	Rule learning	A/V - check to see if Sporlan has slides on this to use as samples
5. Replace burn out compressor	Manipulative	Job sheet - provide steps to go through to make change

MAJOR BLOCK AIR CONDITIONING **UNIT NUMBER** AC-18

TASK Troubleshooting and Servicing

UNIT Troubleshooting fans and fan motors

OBJECTIVE(S)

Troubleshooting and repairing or changing a fan or fan motor

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Identify different types of fans (different type motors - 3 phase, single phase, etc. also condensor or evaporator fans)	Concept	Information sheet
2. Procedures for testing different types of motors and motor controls	Rule learning	A/V covering different types of motors - their controls and procedures for troubleshooting the motor Assignment sheet - include different illustrations and have students identify them
3. Change evaporator fan motor	Manipulative	Job sheet
4. Change condensor fan motor	Manipulative	Job sheet

MAJOR BLOCK AIR CONDITIONING **UNIT NUMBER** AC-19

TASK Troubleshooting and servicing

UNIT Performing pre-season start up

OBJECTIVE(S)

Perform pre-season start up

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Procedures for performing a pre-season start up	Rule learning	Information sheet - first cover importance, give justification for performing checkout then cover actual procedure - change air filter, checking belt tension, check whether condensor and evaporator coils are clean, lube any bearing, visually check condition of wiring, start and test run unit checking for proper refrigerant charge, proper amp draw of all motors and free air flow through the system, check condensate for proper drainage. A/V covering all of the above procedures for pre season start up Assignment sheet - student will determine what things should be checked
Perform pre-season start up	Manipulative	Job sheet - list all things to check

MAJOR BLOCK AIR CONDITIONING **UNIT NUMBER** AC-20

TASK Troubleshooting and Servicing

UNIT Troubleshooting air conditioners (refrigeration cycle)

OBJECTIVE(S)

Trouble shoot air conditioner refrigeration cycle

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Procedures		
Determine proper charge	Rule learning	Information sheet - install guage manifold, checking ambient temperature and comparing on a temperature pressure chart
	Rule learning	A/V covering information sheets
	Manipulative	Job sheet - student will be instructe to perform tasks described in info sheet
Handling low charge		Information sheet - leak check procedures - three methods - electronic, soap bubbles and haloid torch.
Handling an over charge or a non condensable		Information sheet - purge or evacuate the entire system
Troubleshooting the refrigeration cycle	Problem Solving/ Manipulative	Job sheet - covering low charge, high charge or non condensable - student will actually trouble shoot the unit
Troubleshooting by symptom	Concept	Information sheet, list of symptoms and their solutions
	Manipulative/ Problem Solving	Job sheet - instructor will bug systems for students to repair using symptom chart

MAJOR BLOCK AIR CONDITIONING **UNIT NUMBER** AC-21

TASK Troubleshooting and Servicing

UNIT Troubleshooting air conditioners (electrical cycle)

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Check unit for proper incoming voltage	Concept	Information sheet - this will refer student to name plate data for proper voltage on both primary and secondary
	Manipulative	Job sheet - actually check a unit for proper voltage
Check all control components (relays, contactors, transformers, capacitors, thermostats, etc. and wiring connected to these components)	Rule learning	Information sheet - student will be referred to manufacturer's installation instruction manual for location of part and to check for continuity
	Problem Solving/ Manipulative	Job sheet - student will be instructed in general procedures for checking out control and what to look for
Troubleshooting by symptom	Concept	Information sheet - list of symptoms and their solutions
	Manipulative/ Problem Solving	Job sheet - instructor will bug systems for students to repair using symptom chart

MAJOR BLOCK	AIR CONDITIONING
UNIT NUMBER	AC-22
TASK	Troubleshooting and Servicing
UNIT	Troubleshooting Air Conditioners (air movement)
OBJECTIVE(S)	

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types of coils	Concept	A/V on types of coils (air cooled, water cooled, tube type, etc). Assignment Sheet - student will identi different types of coils in lab
2. Symptoms of improperly functioning coils	Concept	Text Assignment A/V identifying problems with coils Assignment Sheet - student list common symptoms in coils
3. Troubleshoot problems (evaporators, condensors air and water cooled)	Manipulative	Job Sheet - simulate problems and have student fix.
4. Procedures for cleaning coils	Rule Learning Manipulative	Job Sheet - procedures for and assignment to clean coils

MAJOR BLOCK AIR CONDITIONING **UNIT NUMBER** AC-23

TASK Heat Pump

UNIT Understanding principles of the heat pump

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Principles of heat pump (reverse cycle air conditioning)	Concept	Text Assignment or Information sheet describing what a heat pump is A/V on heat pump systems to illustrate the heat pump cycle Assignment sheet - with questions covering heat pump fundamentals
	Manipulative	Job sheet - student will simply operate heat pumps and measure temperature differences and pressures (see it in operation). Instruct student as to where to take pressure readings Have some cut away illustrations of a reversing valve here
2. Types of heat pumps	Concept	Information sheet - talk about different types - air to air, water to air, water to water and solar assisted - include illustrations
	Concept	Text Assignment - on types of heat pumps
	Discrimination	Assignment sheet - questions on types of heat pumps
	Discrimination/ Manipulative	Job sheet - identify types of heat pumps in shop

MAJOR BLOCK AIR CONDITIONING UNIT NUMBER AC-24

TASK Heat Pump

UNIT Evacuating and changing the heat pump

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Review evacuating procedures	Concept	Information sheet - review or summary of evacuation procedures.
2. Charge heat pump	Rule learning	**Information sheet on how to charge a heat pump
	Rule learning	A/V illustrating how to charge a heat pump
	Discriminative/ Manipulative	Assignment sheet will have multi choice questions on charging unit and evacuating
		*Job sheet - evacuate and charge the heat pump
		*Charge will include heating cycle as well as heat cycle depending however on weather
		**Talk about exceptions to the general charging rules (i.e. Westinghouse, Hi-rely, Fedders, Chrysler, Clim-Control roteries.

MAJOR BLOCK AIR CONDITIONING UNIT NUMBER AC-25

TASK Heat Pump

UNIT Installing reversing valve (refrigeration cycle)

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Principles of reversing valve	Concept	Information sheet on principles of the reversing valve include cut-away illustrations
	Manipulative	Job sheet - use a reversing valve as a mock up (if accessable) allow student to hook up to pressure and electricity to observe actual function and clarify operation.
	Discriminative	Assignment sheet - questions on the operating principles
	Manipulative	Job sheet - on an actual unit student will determine high and low side of valve through measuring pressures.
Changing reversing valve	Rule learning	Information sheet - changing reversing valve
	Manipulative	Job sheet - mock up reversing valve (may be home made unit with pipe going into canister resembling valve) Student will solder pipe on to canister without overheating.

MAJOR BLOCK AIR CONDITIONING UNIT NUMBER AC-26

TASK Heat Pump

UNIT Refrigeration cycle and components

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Piping cycle	Concept	Information sheet - diagram of a detailed piping cycle including labels of parts and explaining briefly each part
	Concept	A/V giving a more detailed description of the components
Metering devices .expansion valves .capillary tubes .two way expansion valves	Concept	Assignment sheet describing components
Check valves	Concept	Information sheet
	Manipulative/ Discriminative	Job sheet - identify components on units (two and three)
Suction line accumulator	Concept	Text assignment - plus information sheet with illustrations if appropriate illustrations are not located in Text.
		Assignment sheet - questions covering area
Refrigeration cycle	Problem Solving	Job sheet - cumulative activity - student will provide to instructor the same types of information that the initial diagram gave him/her using a live unit as a reference point

MAJOR BLOCK AIR CONDITIONING UNIT NUMBER AC-27

TASK Heat Pump

UNIT Installing electrical circuits

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Heat Pump Circuits	Concept	A/V on heat pump circuits go through each component one at a time in a building type process
	Concept	Information sheet - different electrical designs found in different heat pumps
		Assignment sheet - Develop a diagram (electrical scheme) for a heat pump - student will be given specifications to go on.
		Job sheet - Using same specifications found in Assignment sheet and diagram developed there - student will give an actual unit or wire on a simulated board.

MAJOR BLOCK AIR CONDITIONING UNIT NUMBER AC-28

TASK Heat Pump

UNIT Adjusting and repairing defrost controls

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Need and purpose of defrost control	Concept	Information sheet - need for and purpose of a defrost control Assignment sheet - questions
2. Types of defrost controls	Concept	Information sheet - types of defrost Controls (Initiation -- determination) .Pressure .temperature .time .time .temperature
	Manipulative/ Discriminative	Job sheet - discriminate different types of defrost controls in the shop
3. Adjust - repair defrost controls	Rule learning	A/V adjusting and repairing all types of defrost controls
	Manipulative	Job sheet - adjust and/or repair defrost control

MAJOR BLOCK AIR CONDITIONING UNIT NUMBER AC-29

TASK Heat Pump

UNIT Designing supplementary heating systems

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Need for supplementary heating systems	Concept	Information sheet - need for supplemental heat with a heat pump
2. Determine balance point		Information sheet - determining the balance point (when the supplementary heat system is engaged) Assignment sheet - will have questions on Need and Balance point Assignment sheet - give specifications and student must determine balance point Information sheet - types of supplemental heat -electric strip -gas (natural or LP) -Fuel Oil
3. Install supplementary heat system		A/V Installing procedure for electric strip heat Job sheet - install strip heat in a heat pump system
4. Outdoor thermostat	Concept Rule learning Manipulative	Information sheet - what an outdoor thermostat is and how to adjust it Job sheet - Install and adjust outdoor thermostat

MAJOR BLOCK Air Conditioning UNIT NUMBER AC-30

TASK Heat Pump

UNIT Installing package heat pump

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Installation procedures	Rule Learning	Information Sheet - should be similar to an installation manual except general. Should give general installation cautions as well as procedures.
	Manipulative	Job Sheet - give student manual for installing particular unit. Then have student checkout unit via operat and readings

MAJOR BLOCK Air Conditioning UNIT NUMBER AC-31

TASK Heat Pump

UNIT Installing Split System

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Installation Procedures	Rule Learning	Information Sheet - similar to an installation manual except in general terms, primarily procedural. Assignment sheet - have student compile a list of materials to use in the installation Job Sheet - give a student the manual for the unit to be installed - Job will include wiring, piping and checking out unit

MAJOR BLOCK Air Conditioning **UNIT NUMBER** AC-32

TASK Heat Pump

UNIT Troubleshooting heat pump

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Troubleshooting procedures		Information Sheet - give student a general, logical process which may be used in troubleshooting. This will include trouble shooting procedures. A/V - give the student information on what the customer says is wrong - then shoot how to troubleshoot the problem make sure it is a fairly complex problem. Suggested Instructor Check Point - At this point the instructor should give the student oral questions to determine his/her grasp to general trouble shooting procedures Job Sheet - have student trouble shoot 4 or 5 units

MAJOR BLOCK

HEATING

HE-01 -- HE-29 Post Secondary

MAJOR BLOCK Heating UNIT NUMBER HE-01

TASK Electric Heating Systems

UNIT Principles of electric furnaces and controls

OBJECTIVE(S)

Understand principles of electric furnace and controls

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Furnace Components A. Air Handlers B. Elements C. Controls D. Sequencers E. Overloads	Concept	Text and Information Sheets to review concepts and describe components Assignment Sheet with questions Audio visual zero in on each component
2. Furnace Operation		Text Assignment
3. Operate the Furnace	Manipulation	Job Sheet - Data sheet with assignment as to what to check on the furnace such as: A. Fan current B. Element current C. Volt Fan D. Volt Element Assignment Sheet - List an operational sequence for assigned furnace(s) (Use diagram and have student label operations) Job Sheet - Includes a description of what the furnace should do - 3 heating elements overload protected sequenced fan interlock Then student will design system (schematic wiring diagram) Audio visual will include components and illustration of operation of furnace.

MAJOR BLOCK Heating **UNIT NUMBER** HE-02

TASK Electric Heating Systems

UNIT Installing electric furnaces

OBJECTIVE(S)

Install an electric furnace to manufacturers specifications (and NEC code)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Installation Inst.	Rule learning	Information Sheet with illustrations will cover a review of power wiring and thermostat installation as they relate to electric furnaces
2. Install Furnace A. power wiring C. control wirwng	Manipulative	Job Sheet will tell student to follow installation instruction manual - student will actually install equipment in accordance to NEC code specific procedur will be included in the job sheet

MAJOR BLOCK HEATING **UNIT NUMBER** HE-03

TASK Electric Heating Systems

UNIT Troubleshooting electric furnaces

OBJECTIVE(S)

Locate and repair problems in electric furnace

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Troubleshooting	Rule learning	Information Sheet - review from electrical troubleshooting methods. General aspects of troubleshooting.
Procedures	Rule learning	Slide/tape - showing furnaces in operation and how to check amps
Troubleshoot A. Transformer B. Thermostat C. Sequencer D. Relay E. Elements F. Fusible links G. Overloads H. Fan Motor (At discretion of instructor)	Manipulative	Job Sheet - indicating to student equipment to troubleshoot. Will include procedures specific for electric furnace.

MAJOR BLOCK HEATING **UNIT NUMBER** HE-04

TASK Gas Heating Systems

UNIT Applying gas fuel combustion and safety principles

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Types of Gas A. Weight (SG) B. Heat Content	Concept	Information Sheet
2. Hazards of Gas A. Explosive B. Toxicity C. Combustion Products D. Leaks	Concept	Text and Information Sheet - safety precaution Assignment Sheet to reinforce with questio Job Sheet - student will recognize hazards, perform leak test, recognize hazardous conditions, combustion air, venting.
3. Basic Combustion Principles A. Fuel, Air, Heat	Concept	Information Sheet with illustrations on the information sheet - combustion triangle
4. Combustion Process in Furnace	Concept	Information Sheet - cubic feet of air to burn cubic feet of gas, etc.

MAJOR BLOCK HEATING UNIT NUMBER HE-05

TASK Gas Heating Systems

UNIT Understanding Basic Systems (types of furnaces)

OBJECTIVE(S)

Identify components and types of furnaces.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Basic System A. Source B. Lines 1. Regulator 2. Valve 3. Pilot 4. Burner 5. Exchanger 6. Ventilator	Concept Rule-learning	Information Sheet Slide/tape
2. Label Diagram		Assignment Sheet
3. Types of Furnaces	Concept	Information Sheet. Use illustrations to clarify types (explanation of each type of furnace)

MAJOR BLOCK HEATING **UNIT NUMBER** HE-06

TASK Gas Heating System

UNIT Checking gas sources

OBJECTIVE(S)

Read.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Gas Sources	Concept	Information Sheet with illustrations (will include gas tanks, meters, illustrations of dials and explanation)
2. Clocking Meter	Concept	Job Sheet-concerning clocking a gas meter Textbook OR
3. Using Manometers	Concept	Information Sheet with illustration or what it is and how to use it can be adapted from tool instructions
4. Reading Manometer	Manipulative	Assignment Sheet - reading manometer from diagrams
5. Procedures for Care and Use of the Manometer	Rule-learning	Slide/tape giving details
6. Checking the Source	Manipulative	Job Sheet-includes LP and natural gas

MAJOR BLOCK HEATING **UNIT NUMBER** HE-07

TASK Gas Heating Systems

UNIT Gas piping principles

OBJECTIVE(S)

Size Thread and Install gas piping (to NFPA # 54)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Gas Piping Rules A. Materials B. 5 Factors NFPA in sizing C. Fire protection code (Standard Gas Code Southern Building Code Congress International Inc., 3617 Eighth Ave., S. Birmingham,AL 35222)	Concept	Information Sheet. Summarize information concerning piping. Slide/tape of pipe installation.
2. Size Hypothetical Systems	Differentiation	Assignment Sheet. Diagrams, etc. Determine pipe size, code, etc.
3. Threading Pipe	Manipulative	Job Sheet. Build maze of threaded pipe.
4. Install Gas Piping	Manipulative	Job Sheet. Check of: 1. Type gas: Heat content, specifi gravity. 2. Length of run 3. Consumption 4. Allowable pressure drop 5. Material-pipe, pipe dope, etc. Include in Procedure to Use the National Gas Code. Pipe from source to unit.

MAJOR BLOCK HEATING **UNIT NUMBER** HE-08

TASK Gas Heating Systems

UNIT Adjusting regulators

OBJECTIVE(S)

Install and adjust regulators.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Basic Function Operation	Concept	Text. Information Sheet with illustrations of regulators
Application 1. Types 2. Installation	Concept	Information Sheet. LP/Natural with illustrations:venting, location, capacity.
Dismantle Regulator	Rule-learning	Information Sheet with illustrations - single stage, double stage. Job Sheet (Illustration of exploded view of regulator and procedures to disassemble. Have students disassemble and reassemble.)
Adjust Regulator	Rule-learning Manipulative	Job Sheet - Procedures in adjustment. Include certain concepts related to regulator adjustments.

MAJOR BLOCK HEATING UNIT NUMBER HE-09

TASK Gas Heating Systems

UNIT Installing and servicing gas valves.

OBJECTIVE(S)

Recognize and Install Gas Valves

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Basic Function and Operation A. Soloroid B. Diaphram C. All Operators	Concept	Information Sheet with illustrations and possibly text if available
Disassemble Valves	Manipulative	Slide/tape with what goes wrong with valve, how to disassemble and install Job Sheet
Install Valves	Manipulative	Job Sheet. Install a valve in a unit. Procedures. Illustration of valve Location on furnace

MAJOR BLOCK HEATING **UNIT NUMBER** HE-10
TASK Gas Heating Systems
UNIT Installing and servicing pilot ignition devices
OBJECTIVE(S)

Diagnose problems in pilot ignition devices.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Pilot Ignition Devices	Concept	Slide/tape. General introduction to function of ignition devices (Ignition safety).
2. Ignition	Concept	Information Sheet (Illustrations) Pilot Burners, Direct Sparks, Spark or Glow Coil (indirect spark ignition)
3. Safety Thermocouple	Concept Manipulative	Text Assignment. Include safety switch. Job Sheet. Heat thermocouple and measure millivoltage.
4. Mercury Bulb Bi-metal Electronic Module	Concept	Information Sheet Illustrations Explain how each works and where and why.
5. Combination of Ignition and Safety	Discriminative	Job Sheet. Send a student to unit and determine the type ignition and the type safety device. (At least 3 heating units) Serial and model numbers.
6. Procedure	Rule-learning	Slide/tape. Include safety switch.
7. Standing Pilot Flame and Thermocouple	Manipulative	Job Sheet. 1- light pilot and adjust 2-observation 3-create problem loosen thermocouple, move thermocouple from pilot flame
8. Intermittent Pilot with Electronic or Spark Ignition	Concept	Information Sheet
9. Same as above (8)	Manipulative	Job Sheet.

MAJOR BLOCK HEATING UNIT NUMBER HE-11

TASK Gas Heating Systems

UNIT Installing and Servicing Combination Gas Valves

OBJECTIVE(S)

Understand operation of and troubleshoot combination gas valve.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Explanation of Components of Combination Gas Valves	Rule-learning	Information Sheet. Explaining the different types and how they work A/V complete breakdown of valve and location Assignment Sheet. Questions based on information sheet and A/V. Job Sheet. Refer student to valve-tear it down and see how it works A/V-procedure for installing and servicing Job Sheet. Student will install and service an assigned unit.
2. Install and Service Combination Gas Valve. 1-install 2-leak check 3-light pilot 4-adjust pilot flame 5-check hold in and drop out current 6-check the coil that turns valve on 7-adjust (check) pressure on regulated side of valve before and after (with unit on and off)	Manipulative	

MAJOR BLOCK HEATING UNIT NUMBER HE-12

TASK Gas Heating Systems

UNIT Servicing burners

OBJECTIVE(S)

Identify and service burners.

Checking and cleaning.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Introduction to Burners	Concept	Information Sheet-Types of burners- *atmospheric, high pressure, luminous, pre-mix. Illustrations. Assignment Sheet based on information above. Slide/tape showing procedures for job sheets below.
2. Adjusting Primary Air	Manipulative	Job Sheet on what a good flame is, how to adjust it.
3. Servicing Burner	Manipulative	Job Sheet. Pull out burner, clean it, re-install and check operation including primary air.
		* Atmospheric - Drilled Port, Slotted, in-shot, ribbon.

MAJOR BLOCK HEATING **UNIT NUMBER** HE-13

TASK Gas Heating Systems

UNIT Inspecting and determining temperature rise of heat exchanges.

OBJECTIVE(S)

Inspect a heat exchange and determine the temperature rise.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Review of Heat Exchangers	Concept	Information Sheet containing the purpose, construction, etc, with illustrations of types.
2. Introduce Types of Exchanges: Sectionalized Barrel Water	Concept	
3. Procedure for Determining Temperature Rise	Rule-learning Manipulative	Slide/tape on procedure for determining temperature rise and how to inspect for cracks. Information Sheet on how to do it.
4. Inspecting for Cracks in Heat Exchanger	Discriminative	Information Sheet on causes of cracks. Assignment Sheet. Questions. Job Sheet. Procedure for determining heat rise and how to inspect and have student actually determine heat rise and inspect for cracks.

MAJOR BLOCK HEATING UNIT NUMBER HE-14
TASK Gas Heating Systems
UNIT Venting Heat Systems
OBJECTIVE(S)

Vent a gas heat system.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Introduction to Principles of Venting Operation (now it works)	Concept	Information Sheet or Text Assignment depending on availability.
Combustion Air Requirements	Rule-learning	Information Sheet or Text Assignment Assignment Sheet - give BTU rating and type of gas and ask how many cubic feet of combustion air and determine the square feet of opening.
Sizing Vent Pipe	Rule-learning	Information Sheet-materials/information are available in pamphlet form Assignment Sheet-figure out single vent, combination vent, manifold vent and multi-story vent-give diagrams and have student do sizing calculations.
Installing Vent Pipe	Manipulative	Slide/rule-physical installation procedures for vent pipe. Job Sheet-actually installing vent pipe-sheet should refer to code book as a reference.

MAJOR BLOCK HEATING **UNIT NUMBER** HE-15
TASK Gas Heating Systems
UNIT Servicing electrical controls
OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Components and Sequence of Operation thermostat transformer gas valve fan switch limit switch fan motor	Concept Manipulative	Information Sheet-general introduction about what components do (not specific at this point) Slide/rule-same as above Job Sheet-student will turn furnace on - measure voltage at gas valve-measure voltage fan switch and voltage at limit switch-turn off.
Fan Switches	Concept	Information Sheet with illustrations covering temperature operated and time delay.
Limit Switches	Concept	Information Sheet with illustrations covering upper auxillary limits as well as standard
Combined Fan-Limit Switches	Concept Manipulative	Information Sheet with illustrations Assignment Sheet -student will locate at least one of each component described above by giving model number and temperature settings for each. Job Sheet 1) Disconnect fan motor and record results (measure voltage at limit switch). 2) Tape burner orifice on two of three burners, turn on and observe fan switch.
Forced Combustion		Information Sheet-principles, components, and sequence-illustrations. 1) direct spark 2) electric pilot ignition systems 3) open circuit the heat anticipator

MAJOR BLOCK HEATING UNIT NUMBER HE-15 (cont'd)

TASK Gas Heating Systems

UNIT Servicing electrical controls

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Combustion Blower		Information Sheet-Air pressure switches and sail switches
Control Systems		Information Sheet-Glow coil ignition, direct spark ignition Job Sheet- 1) turn on thermostat 2) check voltage at sail switch or air pressure switch 3) check voltage at pilot ignition device 4) turn off and observe 5) disconnect combustion blower 6) turn on 7) record voltage across sail or air switch 8) check voltage at pilot device.

MAJOR BLOCK HEATING **UNIT NUMBER** HE-16

TASK Gas Heating System

UNIT Determining combustion efficiency

OBJECTIVE(S)

Perform a combustion efficiency test on a gas furnace.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Principles of Combustion Efficiency Test	Concept Rule/learning	Information Sheet on use of the (Fyrerite) combustion efficiency kit * Slide/tape. Someone going through the actual test explaining what and how. Assignment Sheet. Answer questions-give readings and have student determine what the combustion efficiency is and if it is safe.
. Perform Combustion Efficiency Test	Manipulative	Job Sheet-Perform a task (testing actual equipment) * Things to check for: -stack temperature -CO^2 percentage -O^2 percentage -CO percentage -draft

MAJOR BLOCK HEATING **UNIT NUMBER** HE-17

TASK Gas Heating System

UNIT Performing pre-season checkup and start-up

OBJECTIVE(S)

Perform a pre-season check on a gas furnace.

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
1. Introduction of Preventive Maintenance Checklist	Rule-learning Manipulative	Information Sheets. Student will review more than one recommended procedure on information sheets and possibly textbooks. Slide/tape showing step by step what to do and how to do it (preferably using Bessler Q-C). Student will develop his/her own checklist and get approval from instructor. Job Sheet. Actually perform checkup.

MAJOR BLOCK HEATING UNIT NUMBER HE-18
TASK Gas Heating Systems
UNIT Troubleshooting the heating system.
OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Troubleshooting Procedures	Concept	Information Sheet. Troublshooting procedures.
	Rule-learning Discriminative Manipulative	Slide/tape. Troubleshooting procedures. Job Sheet. Troubleshoot furnaces. Combustion Problems: 1- leaks, restriction in gas line 2- gas valve 3- manifold and burners 4- heat exchanger 5- vent and draft diverter Electrical Problems: 1- thermostat 2- transformer 3- fan-limit switch 4- fan motor Student should work on at least three combustion and three electrical problems on at least two different systems.

MAJOR BLOCK Heating **UNIT NUMBER** HE-19

TASK Oil burning heating systems

UNIT Identifying types of fuel oil and principles of combustion

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Types of fuel oil (six grades)	Concept	Information sheet--with a chart explining each type of oil
	Descriptive	Assignment sheet containing questions on material presented on information sheet
Combustion principles of each type of oil	Concept	Information sheet--make sure a contrast is presented with gas principles of combustion. Also give an overview on how the whole system works
		Job sheet

MAJOR BLOCK Heating UNIT NUMBER HE-20
TASK Oil burning heating systems
UNIT Designing and installing oil piping
OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Setting tanks	Concept	Information sheet on setting the tanks. Will have charts explaining how (such as in the old program). Assignment sheet--Student must solve some hypothetical problem ie. give problems or symptoms or give a burner type and student must locate tank. Student must give complete description of installation.
Installing one pipe systems	Concept	Information sheet--descriptions, when system can be used etc. Also describe oil filter.
	Manipulation	Job sheet--Install tank and run pipe to burner and check oil filter.
Installing two pipe system	Concept	Information sheet--Same as one pipe sys.
	Manipulation	Job sheet--Same as one pipe system.

MAJOR BLOCK Heating UNIT NUMBER HE-21
TASK Oil burning heat system
UNIT Installing oil burners
OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Introduction to oil burners	Concept	Information sheet covering: 1. High pressure burner 2. Low pressure burner 3. Vaporizing 4. Rotary burner Will describe each in relation to the different types of oil--Just an overview.
Low pressure burner	Concept	Information sheet--covering components and operation 1. Pumps 2. Blowers 3. Nozzle 4. Electrodes 5. Transformer 6. Couplings 7. Motors Overview of the above 7 components and their relationship to the burner
	Manipulation	Job sheet--Diagram of blow-up of burner given. Then student must take it apart and label parts.
		A/V procedure for installing oil burner
	Manipulation	Job sheet--Install a burner

MAJOR BLOCK Heating **UNIT NUMBER** HE-22

TASK Oil burning heating systems

UNIT Installing and servicing transformer and electrodes

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Operation of the ignition system	Concept	Covers operation of the ignition system. Describes both transformer and electrodes separately.
Servicing transformers	Concept Rule learning	Information sheet--transformer with illustrations and how to check out.
Servicing electrodes	Concept	Information sheet--electrodes with illustrations and how to check out.
		A/V service procedures of an ignition system
	Manipulative	Job sheet--Install and check ignition system. Transformers--check primary Check secondary windings Electrodes--inspect the tips, angle, and insulation

MAJOR BLOCK	Heating
UNIT NUMBER	HE-23
TASK	Oil burning heating systems
UNIT	Installing oil pumps
OBJECTIVE(S)	

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Oil pump operation	Concept	Information sheet--an operation of fuel pump--cover single stage and two stage pumps with illustrations
	Manipulative	Job sheet--exploded view of pump (two stage) provided student will take pump apart, label parts and reassemble
Servicing the pump	Rule learning	Information sheet--to explain how to service the pump A/V showing service procedures
	Manipulative	Job sheet --Install and service oil (to include) 1. Purge 2. Check and adjust pressure 3. Check strainer 4. Check check-valve

MAJOR BLOCK Heating UNIT NUMBER HE-24
TASK Oil burning heating systems
UNIT Servicing blower, nozzle, motor and coupling
OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Motor	Concept	Information sheet--type of motor, reset button and checking the motor out.
Coupling	Concept	Information sheet--types of couplings with illustrations (similar to Audel p. 76)
		Covering basicly the function
Blowers	Concept Rule learning	Purpose and construction of blower and procedure for servicing blower
Nozzle	Concept	Information sheet--types of nozzles, cleaning, changing, size
	Manipulative	Job sheet--identify four components in relation to information given. Check list will suffice.

MAJOR BLOCK Heating **UNIT NUMBER** HE-25

TASK Oil burning heating systems

UNIT Recognizing types of heat exchangers and performing the combustion test

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Heat exchanger	Concept	Information sheet--types of heat exchanger 1. Water 2. Steam 3. Air--illustrations of actual exchangers
Vent	Concept	Information sheet 1. Types of vent pipe used (c) 2. Barometric damper
Check combustion efficiency	Manipulative	Job sheet--A/V procedures for checking the combustion efficiency and draft

MAJOR BLOCK Heating
UNIT NUMBER HE-26
TASK Oil burning heating systems
UNIT Installing controls
OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Introduction to controls 1. Turn on transformers 2. Turn on pump & blower 3. Safety	Concept	Information sheet covering 1,2,3. Also describe cadmium cell, constant ignition steele switch, and intermittent ignition, stack switch with illustrations
Types of primary controls 1. Cadmium cell 2. Constant ignition stack switch	Concept	Information sheet on fan and limit control (may possibly include this sheet with one above); illustrations
3. Intermittent ignition stack switch 4. Fan and limit controls	Manipulative	Job sheet--student will locate components on unit
	Rule learning	Information sheet on each component and 1-B under primary controls detailing how to wire.
	Manipulative	Job sheet on each component and 1-B under primary controls instructing student to actually wire component

MAJOR BLOCK Heating UNIT NUMBER HE-27

TASK Oil burning heating systems

UNIT Performing pre-season start up and check up

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Check out		
1. nozzel	Concept	Information Sheet-Covering details 1-7
2. operation of primary controls	Rule learning	When to perform the check out (sequence)
3. operational fan and limit switches	Rule learning	A/V covering 1-7
4. combustion efficiency check and adjustment	Manipulative	Job Sheet will instruct student to check out an assigned unit
5. fuel pump pressure		
6. ignition system		
7. fuel oil filter		

MAJOR BLOCK	Heating
UNIT NUMBER	HE-28
TASK	Oil burning heating systems
UNIT	Troubleshooting the oil burning heat system
OBJECTIVE(S)	

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Look for		
1. oilflow problems	Rule learning	Information sheet covering trouble shooting procedures for the entire system - should include a logic tree
2. oil pump		
3. transformer & electrodes		
4. nozzel		
5. primary controls	Rule learning	A/V covering same area as Information Sheet
6. fan limit switch		
7. combustion blower		
8. vent and barometric	Manipulative	Job Sheet - Student should solve at least four problems in two different units

MAJOR BLOCK Heating UNIT NUMBER HE-29

TASK Oil burning heating systems

UNIT Installing humidifier

OBJECTIVE(S)

DETAILING AND SEQUENCING	LEARNING TYPE	TYPE OF ACTIVITY
Effects of the humidifier	Concept	Information Sheet - overview on the effects of a humidifier - why they are needed
Types of humidifiers	Concept	Information Sheet on types of humidifiers 1. pan type 2. atomizing 3. weighed element 4. power Assignment Sheet: questions covering two previous information sheets
Installing humidifier	Rule learning	Information Sheet on how to actually install a unit including installing a humidistat
	Manipulative	A/V - procedure for installation Job Sheet - student must install unit

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